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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

1888.

MISSOURI
BOTANICAL
GARDEN.

LONDON:
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BY EYRE AND SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.

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EYRE AND SPOTTISWOODE, EAST HARDING STREET, FLEET STREET, E.C.; and
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HODGES, FIGGIS, & Co., 104, GRAFTON STREET, DUBLIN.

1888.

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MISCELLANEOUS INFORMATION.

No. 13.] JANUARY. [1888.

XXIX.—COLONIAL FRUIT—(continued).

In *Bulletin* No. 11 for November, 1887, attention was drawn to the subject of fruit growing in British Colonies and a very comprehensive Report on the Fruits of Canada was given. In the present *Bulletin* it is intended to continue the subject and publish reports, which have been furnished by the Governments of other Colonies. These will add considerably to our knowledge of this comparatively new industry. It will be remembered that these reports have been prepared in response to a circular letter issued, at the instance of this establishment, by the Secretary of State for the Colonies.

The list of questions to which answers are now furnished was published in the *Bulletin* for November last, pp. 2–4. This list, if consulted, will afford a key to the arrangement of the Reports, and furnish those interested with the points to which the enquiry has been directed.

An important feature in the Reports now published is the prominence given to the quantity of fruit actually available for export in each colony. To this is added the months during which the fruit is in season and the prices usually paid for it locally.

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1887.

Price Twopence.

It was intended to publish the reports from the Australian Colonies, Tasmania, New Zealand, and the Cape of Good Hope in one series, so as to present a general review of the fruit industries of the Southern Hemisphere. In a subsequent series it was proposed to publish reports dealing exclusively with the fruits of the Tropical Colonies. So far, however, we have not received reports from New South Wales and Queensland, and hence these do not appear in the present *Bulletin.*

VICTORIA.

The Report received respecting the fruits of this Colony is of a very complete character. In forwarding the Report to the Government of Victoria, Mr. D. E. Martin, Secretary for Agriculture, summarizes the results as follows:—

As regards the quantities of each kind of fruit available for export, I may state that so far it appears to me that the quantities produced are not in excess of local requirements, but there is reason to believe that shortly the production will exceed our wants.

The whole of the fruits mentioned below are capable of being produced in much larger quantities than at present, and will be produced if sufficient inducement offers.

As regards the enquiry as to what steps are necessary to start or develop a fruit trade, and what inducements local men desire to open or extend a trade in fresh or preserved fruits, I may state that cheaper rates of freight by railway, a reliable agent in England, extra care in shipping and unshipping, together with cool chambers in the vessels, are considered essential.

In order to ascertain the views of the wholesale fruit dealers on the subject of exportation of fruit to England, I communicated with some of the dealers. By one I was informed that the experiment of exporting fruit had been tried and proved a failure. Another stated that the prices reported as having been realized at the Indian and Colonial Exhibition induced him to try a shipment of fruit as an experiment, and he found that owing, to the cost of packing, freight, and the many charges imposed by the consignees for commission, wharfage, rates, &c., resulted with the prices realized for the fruit in a loss of 50*l.* He charges 7 per cent. on his sales, and that covers everything, but at home they had no fixed scale.

Fruit-growers here could not be relied upon for packing and placing a first-class fruit in boxes ready for exporting, owing to the fact that they could obtain prices here for the fruit, as they at present sent it to market, which the prices they would obtain for the extra trouble and care would not recompense. Another thing is that there is not sufficient first-class fruit suitable for exporting grown here, and the want of material, such as cork sawdust, for packing fruit, is another drawback. The dealer above mentioned obtained 200 cases of lemons from Sydney in one shipment, and from indifferent packing and carelessness in handling the fruit, 50 per cent. of it was useless. He had also obtained fruit from Algiers, and owing to the difference in packing and handling, the quantity of the fruit unsuitable for disposal after its arrival here, was nil, although he had kept it without opening the boxes for a fortnight after its arrival. Foreign growers were educated to the manner of treating fruit which the growers here lacked. Here orchards were only an auxiliary means of livelihood. The ready sale which growers here can obtain, does not necessitate that carefulness in gathering, sorting, and packing, which fruit requires; and the jam factory furnishes as ready a receptacle for bruised or damaged as for sound fruit. He knew of men who had brought their fruit to market in bags. In a catalogue of one of the leading wholesale men in London, quoting prices obtained for oranges, the prices ranged from 4*s.* to 6*s.* 6*d.*, and two lots were disposed of from 8*s.* to 10*s.* per case, the latter being of a superior class. The prices obtained here would compare favourably with the prices quoted, and while the fact remained, growers here would not be induced to try exporting. The lowest price obtained here for apples is about 4*s.* a case. To export them at that price, the case would cost about 10*s.* by the time it was disposed of at home, owing to freight, repacking, commission, and other charges; and the case of apples would not realize that price. At present the colony is not in a position to dispose of its fruit in an export market. He stated the prices reported as having been obtained for fruit at the Indian and Colonial Exhibition were misleading, for the reason that such fruit as that which was disposed of at the Exhibition could not be procured here in sufficient quantity to export. He had obtained 160 cases of fruit from Tasmania to export, but owing to the lateness of the shipment in arriving here, only about 140 cases were trans-shipped, and the balance which remained here realized a better profit than the larger portion which was sent home. He could send fruit to New Zealand, by repacking, and land, and dispose of it there at a profitable price, but he did not think shipments could at present be sent to the English market to the same advantage. He had no doubt, however, but that ultimately as fruit-growing increased, and a better class of it was grown so as to meet the requirements of the home market, exportation would become a success.

The following is a list of Victorian fruit:—

Name.	When in Season.	Local Prices.
Grapes	February, March, and April	4*s.* to 8*s.* per case of 48 lbs.
Apple	January to September	3*s.* to 10*s.* per bushel.
Pear	,, ,,	2*s.* to 10*s.* per case of 48 lbs.
Apricot	January and February	5*s.* to 14*s.* ,, ,,
Peach	December to April	4*s.* to 12*s.* ,, ,,
Nectarine	January to March	5*s.* to 15*s.* ,, ,,
Plum	December to April	2*s.* 6*d.* to 6*s* ,, ,,
Cherry	November to January	3*s.* to 12*s.* ,, ,,
Oranges	July to September	4*s.* to 12*s.* ,, ,,
Lemons	,, ,,	7*s.* to 15*s.* ,, ,,
Figs	January to March	5*s.* to 10*s.* ,, ,,
Walnuts	March	7*s.* to 10*s.* ,, ,,
Almonds	,,	7*s.* to 9*s.* ,, ,,
Quinces	January to March	2*s.* to 4*s.* ,, ,,
Raspberry	January and February	12*s.* to 18*s.* per cwt.
Strawberry	November to January	15*s.* to 25*s.* ,,
Currants, red	December to February	12*s.* to 20*s.* ,,
Gooseberries	,, ,,	8*s.* to 12*s.* ,,

The Grape.

The grape is esteemed the premier fruit of the Australian Colonies. The demand for the produce of the vine is unlimited, as it can be used in such a variety of ways; as a table or dessert fruit, it is at once one of the most delicious and refreshing obtainable, and in the heat of summer invaluable for the invalid. It is believed the grapes of Victoria are superior for wine making to those of the sister colonies, but for raisin-making or distillation, probably South Australia or New South Wales would rank before us, as their grapes contain a greater amount of saccharine matter, although, when large plantations have been made in the Mallee Districts, the case might be materially changed.

The Apple.

No doubt this is also a fruit of the greatest importance, and since the introduction of blight-proof stocks can be grown on almost every kind of soil. Orchards, like vineyards, require proper drainage, and a large amount of intelligence and industry to keep them free from the insect plagues which are already decimating some of the best orchards of the Colony.

From the 16,000 or 18,000 different varieties of apples, perhaps a selection of from 40 to 50 would be found sufficient for most growers for export, cider, and drying. The exportation of the apple to England, India, and other places, combined with drying and cider making, will, in the near future, open up a great market for the orchardist.

The Pear.

This may be classed as a fruit almost equal to the apple, and can be used for exportation, home consumption (as dessert and cooking fruit), drying, and perry making. The tree grows rigorously, and is very prolific, coming into bearing at a much earlier period than in England or the Continent. Considerable shipments of this fruit were made to the Colonial and Indian Exhibition, and most satisfactory prices realized. For some of the choisest varieties the prices were fabulous; most varieties came to hand in excellent condition.

The Apricot.

This magnificent fruit is suited for any district where frosts are not prevalent, the bloom being easily destroyed by frost, or severe winds, or hail storms. When well-grown, it stands first as a jam fruit, is also a beautiful dessert, and when properly prepared by the evaporator, a rich sweetmeat of the highest flavour. There is always a good demand for fine fruit.

The Peach.

Like the apricot, this can also be grown in most parts of Victoria, but to obtain large well flavoured fruit, it requires to be irrigated. The black and green Aphis have of late years caused sad havoc among the peach trees, and the American disease known as the Yellows, has also made its appearance in our peach orchards. The cost of labour and remedies pretty well absorbs all the profits of the peach industry, and unless some cheaper method of destroying the Aphis can be found, they will scarcely pay for growing.

The Nectarine.

All that has been said of the peach applies to this very deliciously delicate fruit. Some of the varieties appear to resist the ravages of the Aphis better than the peach. These require good soil and good cultivation.

The Plum.

Plums of all descriptions grow well in most districts of Victoria, and for jam making and drying, are a most valuable fruit. The French and Italian prunes should be very much more extensively cultivated, and an unlimited demand exists for these in their dry state.

The Cherry.

This being one of the first fruits to come into the market, is always in great demand. Being chiefly used for dessert, and being very prolific, it is sold at prices within the reach of the poorest people. Some of the later varieties have been shipped to the neighbouring colonies, such as Queensland, New Zealand, &c., &c., and bring very remunerative prices.

The Orange and Lemon.

These fruits can be grown in Victoria, where frosts do not prevail, but require a moderate protection from hot winds in summer as well as from the frosts of winter. The lemon appears to be the hardier, and when it ripens here there is generally a good demand in the local market. Large plantations of lemons would be very valuable.

The Fig.

There are a great many varieties of this fruit, and the hardy sorts do well in and around Geelong. The varieties suitable for drying are those which should be most cultivated, and although a trifle smaller than some others, are very prolific, and very excellent as a dessert fruit. The demand for these, like the fruit of the vine, will be, at no distant date, unlimited. The cultivation of the fig is very simple, and the tree does not appear to be subject to so great a number of pests as many other kinds of fruit.

The Olive.

The olive trees thrive well in some parts of the Geelong District, and many of them fruit well; but in the early days of planting, a large number of a bastard kind was sent into the Colony, and these have been perfectly barren. These are remarkable for the large amount of scale blight, which is spreading wherever trees have been planted, and fruitful olives are in great danger of being entirely destroyed.

The Walnut.

This should be much more extensively planted. In the Gippsland and Western District they would grow to a great size. The timber in after years would become very valuable for cabinet work, while the fruit produces an excellent oil, in addition to being very popular for dessert.

Almonds.

Both bitter and sweet almonds arrive at great prefection, but the demand for them is limited at present, and consequently they are not a very profitable commodity.

The Quince.

This is much cultivated, and grows well in any low-lying good land. It is much in demand for jams and jellies, but from the supply being rather large, the price of the fruit at present is considered low. Probably, when the fruit evaporator comes into more general use, the value will be greater. It is a hardy tree, and requires but little trouble in growing, pruning, &c.

The Raspberry.

In many parts of the Colony this can be grown to perfection. In and around Lillydale, Daylesford, and the Western District, very large plantations have been made. The fruit is in great demand in the season from private persons, who buy largely of this delicacy to manufacture their own jam in preference to buying the adulterated article, which is placed upon the market under the name of "raspberry jam."

The Strawberry.

Although one of the finest early dessert fruits, the large amount of labour expended on strawberry culture renders it in many places unprofitable, especially as of late years the *Tyloderma fragariæ* (or brown borer) has committed great ravages, entirely destroying whole plantations; and as a complete remedy for this pest, there appears nothing but eradication and burning. There is always a great demand for the fruit in populous districts, and as many tons finds its way into jam factories as are consumed in dessert.

The Gooseberry and Currant.

These can almost be classed together, as far as cultivation and demand for the fruit is concerned, being adapted for preserves, dessert, or wine-making. They will always be extensively grown and used, both for home consumption and export. They are both very valuable fruits, and deserve a large amount of cultivation.

There are many minor fruits which in time will, no doubt, be introduced into these Colonies, but the foregoing are at present the ones which can be profitably increased.

The fruit growers would, no doubt, be greatly benefitted, and their future welfare ensured to a very great extent, by the various Governments giving greater facilities for *cheap* transit over all railways, in refrigerating cars, or other carriages adapted for speedy conveyance of fruit throughout the Colonies. Also the fitting of the mail steamers with refrigerating chambers for transmitting fruits of all kinds to England, India, &c., &c., at reasonable rates, and also the granting of bonuses to companies or private individuals for the production of a given quantity of the best preserved fruits and vegetables of the varieties best adapted for exportation or home consumption, such as raisins, figs, apples, pears, quinces, apricots, peaches, plums, &c., also potatoes, onions, carrots, parsnips, sweet herbs, &c., &c.

The total value of dried, preserved, and fresh fruit imported into the Colony of Victoria during the year 1886 was 217,589*l*. The total value of dried, preserved, and fresh fruit exported during the same period was 75,162*l*. The value of fruit imported was therefore larger by 142,427*l*. than the value of the fruit exported from the Colony.

SOUTH AUSTRALIA.

The following Report on the fruits of South Australia has been prepared for the Government by Mr. John F. Pascoe:—

I. The order of importance is, to a certain extent, a matter of opinion, and varies slightly in periods of years. Until within the last four or five years, I considered the apple our most important fruit, but since that terrible pest *Fusicladium*, commonly called "Black Spot," appeared in our orchards, and made such sad havoc, our apple crops have gradually decreased, and now they are of small commercial value; but I am hoping and believe this visitation is only temporary, and that it will disappear in time, as other pests have before, but it will take us many years to recover our former position. The fruits we grow are,—grapes, apples, apricots, pears, peaches, oranges, lemons, quinces, plums, cherries, loquats, raspberries, gooseberries, strawberries, currants, red and black, almonds, figs, walnuts, chestnuts, limes, nectarines, mulberries, pomegranates, olives, guavas, and hazelnuts. These are mostly grown in large quantities, and generally equal to fruits of the same kinds and varieties as can be grown in any part of the world. We also grow, in small quantities, citrons, shaddocks, blackberries, passion fruit, medlars, and white currants.

II. The quantities available for export I cannot give; I can only state whether obtainable in large or small quantities:—

Name.	When in Season.	—	Local Prices.
Grapes	January to May	Unlimited quantities	7*s.* 6*d.* to 10*s.* per cwt.
Apples	January to October	Large „	2*s.* 6*d.* to 5*s.* per bush.
Apricots	December to January	Unlimited „	16*s.* to 24*s.* per cwt.
Pears	December to July	„ „	3*s.* to 6*s.* per bush.
Peaches	December to February	„ „	16*s.* to 24*s.* per cwt.
Oranges	May to October	Large „	8*s.* to 12*s.* per bush.
„	October to December	Limited „	12*s.* to 16*s.* per bush.
Lemons	Generally about same as oranges. Quantities grown not nearly so large, but demand not so great.		
Quinces	March to May	Unlimited quantities	2*s.* 6*d.* to 3*s.* 6*d.* per bush.
Plums	December to April	„ „	6*s.* to 8*s.* per bush.
Cherries	November and December.	Large „	3*d.* to 4*d.* per lb.
Loquats	October to January	Unlimited „	14*s.* to 21*s.* per cwt.
Raspberries	December	Medium „	3*d.* to 4*d.* per lb.
Gooseberries	September to November.	Large „	4*s.* to 6*s.* per bush.
Strawberries	October to December	„ „	4*d.* to 8*d.* per lb.
Currants (Red)	November and December.	Medium „	4*d.* to 5*d.* per lb.
„ (Black)	December and January	Small „	4*d.* to 5*d.* per lb.
Almonds	Fit to gather in January and February; procurable all the year. Grown in large quantities.		5*d.* to 6*d.* per lb.
Figs	Not fit for export; will not stand the long journey. Grown in large quantities.		
Walnuts	Harvested in March; procurable for greater portion of the year. Grown in small quantities.		9*d.* per lb.
Chestnuts	April and May	Limited quantities in husks.	5*d.* to 6*d.* per lb.
„	„	Limited quantities, clean nuts.	9*d.* per lb.
Limes	May to October	Small quantities	Nominal.
Nectarines	February	„ „	8*s.* to 12*s.* per bush.
Mulberries	—	Unlimited „	Nominal.
Pomegranates	March to June	Medium „	Nominal.
Olives	Grown in large quantities. No demand for the fruit.		4*s.* to 8*s.* per cwt.
Guavas	Grown in small quantities. No demand for the fruit.		Nominal.
Hazelnuts	Grown in small quantities; little demand; clean nuts.		6*d.* to 7*d.* per lb.

III. Cannot give quantities or value.

No dried fruits exported worth mentioning, except almonds; and, considering that, with our excessive duties on dried fruits, we cannot keep them out of our market, we are not likely to export any.

Grapes are exported to Victoria in large quantities, and realise good prices; formerly we exported to all the neighbouring Colonies, especially New South Wales and New Zealand, but of late years those Colonies have prohibited their importation in the regulations for preventing the spread of "Phylloxera," a disease, I am happy to state, that does not exist in our Colony. Last year New South Wales relaxed the conditions with regard to the mining district of Silverton. We send a few cases there now, and when the railway is completed, shall probably send large quantities.

Apples are shipped to New South Wales, Queensland, Western Australia, Mauritius, Ceylon, and, for several years, in limited quantities to England.

Pears to Western Australia, Victoria, New South Wales, and Queensland, and to England in small quantities.

Apricots in large quantities, chiefly to Victoria.

Peaches in large quantities, chiefly to Victoria.

Loquats: during the season the trees bear heavily, these are sent in large quantities to Victoria.

Almonds to Victoria and New South Wales in large quantities.

Chestnuts to New South Wales in limited quantities.

Navel (Bahia) oranges to Victoria in limited quantities at satisfactory prices.

IV. All the fruits mentioned in reply II. can be grown in unlimited quantities. We have the soil, climate, and the will, but want the incentive, that is, a market to which we can send with a chance of getting a fair return. For many of our fruits the English market is available, but we want cheaper freights, reduced incidental expenses, and a guarantee for fair and proper returns.

A bushel of apples costing in Adelaide 4*s.*, sent to England in the ordinary way, would have to realise nearly 9*s.* to pay the shipper net cost. To give you an example,—

Per Orient steamer "John Elder," I sent last year to the Colonial and Indian Exhibition, 50 cases of fruit, which realized—

	£	*s.*	*d.*	£	*s.*	*d.*
				55	3	0
A good price, and ought to have shown good profit; but the expenses were—						
Commission, &c. on sale by Commissioners - - - -	33	15	4			
Freight and incidental expenses -	7	14	0	41	9	4
				13	3	8
Deduct cases - - -				2	10	0
				£11	3	8

or about 4*s.* 6*d.* per bushel net returns. Considering this lot consisted of the choicest samples obtainable, it certainly gives very little encouragement. It is incidents of this kind which disgust shippers.

V. The quantities of fruits imported into this Colony are limited, our local supplies of popular fruits being in excess of all demands.

Hitherto we have been importing large quantities of oranges from New South Wales, but our supplies now equal the demand, and all being well in a few years we shall have large quantities for export. Pineapples, bananas, and passion fruit are brought in limited quantities from Fiji and Queensland, but the quantities are very small.

VI. I do not know that I can say much on this point, South Australia has always been noted for the excellent quality of its fruit, and taking it on the whole, I doubt if there is another country on the face of the globe that can produce in such abundance all those popular fruits needed by civilised communities. For a quarter of a century we have been exporting large quantities, but at present our orchards are under a cloud; they are terribly infested with pests, insect and fungoid, I believe, temporarily, but while they exist, a large portion of our population suffer great pecuniary loss. The kinds most afflicted are apples, pears, apricots, peaches, almonds, cherries, and oranges. Growers have tried all the remedies suggested with little or no good effect, what is wanted is a thorough scientific examination of our soils, &c. for the purpose of putting us on the right track for combating and annihilating our fruit-growing enemies; private persons can only do this on a small scale; to be effectual it must be done by the Government or societies.

The following supplementary Report has been prepared by Mr. Thomas Hardy:—

I. Grapes, apples, apricots, oranges, lemons and citrons, plums of all kinds, pears, peaches, cherries, quinces, gooseberries, raspberries, nectarines, almonds, walnuts, chestnuts, filberts and hazelnuts, loquats, pomegranates, guavas, &c.

II. Grapes from December to May. Apples from November to May. Apricots from December to January. Oranges from May to December. Lemons all the year. Plums from November to March. Cherries, November. Pears from December to April. Peaches from December to March. Loquats from October to November. Nuts from January to March. (The quantities available for export, and prices could be given better by Mr. J. F. Pascoe, who is both a grower and dealer in fruits.)

III. Grapes are exported in large quantities to Melbourne; no other fruit is exported in any quantity.

IV. There is scarcely any limit to the capable production of fruits in the neighbourhood of Adelaide. The orange and lemon, the vine and almond, flourish in the warm plains, the apple, plum, and berries flourish in the hills as well as in any country in the world.

The principal things wanted to open up and extend the trade in fruits, are cheaper freights, more honesty in the dealer in fruit in England, better knowledge of the kinds of fruit required to suit the markets, and the best time of the year to send away from here.

V. Considerable quantities of oranges are still imported from Sydney; also from Europe, large quantities of dried fruits, principally currants and raisins, which could all be produced here.

VI. The grapes grown near Adelaide are the finest produced in Australia, and for the last 35 years have taken first place in the Melbourne Market. A large quantity of grapes were formerly exported to Sydney and New Zealand; but for the last three or four years have been prohibited, owing to the Phylloxera scare and the desire to shut out the competition of this Colony's produce among the growers in these Colonies. The Phylloxera never having appeared in this Colony, there is no valid reason for our grapes being prohibited in any of the Colonies.

There are no native fruits of any commercial value in this Colony.

WESTERN AUSTRALIA.

The following is an extract from a despatch from Sir F. Napier Broome to Sir H. Holland, dated Perth, Western Australia, 21st April, 1887, No. 84:—

I also enclose, for transmission to the Director of the Royal Botanical Gardens at Kew, a paper containing information respecting the fruit production of the Colony.

Numerous tracts of land in Western Australia are admirably suited for the cultivation of the grape. I believe it would be a very remunerative commercial speculation to make wine for the French market. A strong full-bodied and well-tasted wine of a Burgundy character, could be easily and cheaply produced in any quantity, and I feel sure it would command a ready market, not only for consumption, but, and perhaps chiefly, for mixing with French wines, for which purpose I am led to believe it would be most valuable and sought after. The vine disease of *Phylloxera* is unknown in Western Australia. If French wine growers or merchants could be made aware of the unlimited source of wine supply which might easily, quickly, and inexpensively be developed in Western Australia, I feel sure that the matter would have their attention. Were a company formed to start a large vineyard, I think the Government would be able to give some assistance in procuring a suitable block of land.

The following are the chief fruits grown in Western Australia:—

No.	Local Name.	When ripe.	Value.
1	Grape - - -	December to April - -	8*l.* to 16*l.* per ton.
2	Apple - - - -	January to July - -	18*s.* per cwt.
3	Orange - - -	June to October - -	1*s.* 6*d.* per doz.
4	Lemon - -	,, ,, - - - -	1*s.* ,,
5	Pear - - -	December to August - -	4*d.* ,,
6	Fig - - - -	December to March - -	1*d.* ,,
7	Peach - - -	December to May - -	3*d.* ,,
8	Apricot - -	December to July - -	6*d.* ,,
9	Cape Gooseberry -	All the year - - -	6*d.* per qt.
10	Plum - -	January to March - -	—
11	Loquats - -	September to October -	10*s.* per cwt.
12	Banana - -	January to July - - -	1*s.* per doz.
13	Quince - -	February to March - -	5*d.* ,,
14	Strawberry - -	October to June - - -	1*s.* per lb.
15	Melon (water) -	January to March - -	4*s.* per doz.
16	Melon (rock) - -	,, ,, - - -	4*s.* ,,
17	Mulberry - -	,, ,, ,, -	No value.
18	Pomegranate - -	February to March - - -	8*d.* per doz.
19	Gooseberry - -	January. Small supply -	—
20	Currants - - -		
21	Cherries - -		
22	Almond - -	February - - -	15*s.* per cwt.
23	Medlar - - -	February. Very few grown -	—
24	Guava - - -		
25	Olive - - -	June and July - - -	No value.

None of the above fruits are produced at present in sufficient quantities to export, but under favourable circumstances they are capable of being produced in large quantities, particularly grapes and oranges, kernel fruits, as apples, pears, &c., stone fruits, as peaches, plums, apricots, &c. There are thousands of acres of land which would be suitable for fruit-growing, but it requires capital to develop this industry.

At present the supply of fruit is only sufficient for the wants of the inhabitants, and until more land is brought under cultivation by imported labour and capital, there will be no fruits exported.

Oranges and apples are imported into the Colony from Adelaide, Melbourne, and Tasmania during the time that these fruits are scarce in the Colony.

Besides the above-named fruits there are many others which could be cultivated in the more northern parts of the Colony, and others in the southern.

The vine grows well anywhere between the Blackwood and Geraldton. Omitting unsuitable portions, there would be, at a low estimate, 5,000 square miles suitable for the growth of the vine. The citrus tribe do well in the same latitude as the grape, but they require a moister soil. There is a large extent of gravelly loamy soil east of the Darling range very suitable for peach trees.

The cultivation of fruits requires more capital to start with than other agricultural pursuit, and there are very few in this Colony who can afford to wait a number of years before they receive any return for the outlay.

TASMANIA.

On the fruits of Tasmania, the following Report has been received through the Governor of Tasmania, prepared by Mr. F. Abbott, Superintendent of the Botanic Gardens, Hobart Town :—

The apple, *Pyrus Malus*, is extensively grown, and the fruit attains a degree of perfection not ordinarily reached in the other Australian Colonies. Tasmanian grown apples are celebrated for their flavour and keeping qualities.

The early kinds, such as Juneating, begin to ripen late in January, but the bulk of the exported fruit is gathered from March to the end of May ; some of the best keeping varieties keeping sound up to Christmas, or till the early apples are fit for use.

The pear, *Pyrus communis*, is also extensively grown, and exported to the other Colonies, and the same remarks as to quality would apply as in the case of the apple; the season is not quite so extended, the better kinds being over by the end of July.

The plum, *Prunus domestica*, is largely grown, principally for the manufacture of jam; the better kinds are also exported in a fresh state, the season being from January to April.

The apricot, *Armeniaca vulgaris*, is also grown in quantity principally for the manufacture of jam; the trees fruit comparatively early, and the crop, which is in season from January to March, is considered a very paying one.

The peach, *Persica vulgaris*, grows well in suitable soils; grown as standards it fruits very freely, and is of good flavour. The fruit is seldom exported, but is used for local consumption, and hence it has not been very extensively planted.

The nectarine, *Persica lævis*, is not extensively grown; it does not fruit so freely as the peach, and is more subject to the curl and other diseases.

The gooseberry, *Ribes Grossularia*, is largely planted, the fruit being used both for the manufacture of jam and also for export in a green state. The berries attain a large size in suitable situations, and the crop is usually a heavy one. Fruit in season from middle of November to middle of January.

Currants, *Ribes*, red, black, and white. The two former are largely grown for the manufacture of jam, the fruit commencing to ripen in the warmer parts of the Colony in December, and in the latest districts it will hang on the bushes till late in April. The plants bear very abundantly in suitable soils, the fruit being so plentiful as not to pay for picking.

Raspberry, *Rubus Idæus*. This fruit is very extensively grown in the moist bottom lands of the Colony, the canes fruiting abundantly; the crop at times is so heavy as not to pay for picking, and large quantities in the country districts go to waste for want of a market. The fruit is much esteemed for the manufacture of jam, and it is exported in bulk to the neighbouring Colonies, to be used for the same purpose.

Grapes, *Vitis vinifera*. These do fairly well in the warmer parts of the Colony; the earlier kinds, such as Chasselas, Black Hamburg, Sweet Water, and Wantage, ripening well in all seasons; but except for local consumption, the cultivation of grapes would not prove satisfactory in Tasmania generally. The warmer climate of the neighbouring Colonies gives them a decided advantage in this culture. Tasmania could never hope to compete with her neighbours successfully in the production of grapes.

Strawberries, *Fragaria*, are extensively grown, both for local consumption and preserving, and to a limited extent for export. The fruit grows in great perfection, and attains a high flavour, much above that of the warmer Colonies. The Marguerite commences to ripen at the end of October, and is succeeded by Trollop's Victoria and the British Queen, the latter keeping up the supply well into January; in moist seasons small gatherings may be had even as late as May.

Walnuts, *Juglans Regia*, almonds, *Amygdalis communis*, chestnuts, *Castanea vesca*, are all cultivated to a limited extent, and thrive well. The walnut is the most extensively grown, and the nuts are ready for export during March and April.

Filberts, *Corylus Avellana*, do well, and fruit freely in suitable soils; they are not as yet extensively cultivated.

The quince, *Cydonia vulgaris*, medlar, *Mespilus germanica*, fig, *Ficus Carica*, mulberry, *Morus nigra*, and blackberry, *Rubus fruticosus*, are all cultivated to a limited extent, but only for local consumption. A demand has lately sprung up for blackberries for the manufacture of jam, which may lead eventually to the cultivation of the better varieties of this fruit to some extent. The bushes fruit abundantly in suitable situations. The cultivation of the principal fruits has hitherto been regulated by the demand for the different kinds. Various parts of the Colony are well suited to the successful culture of all the foregoing kinds with the exception of figs and grapes, which need a greater amount of heat to thoroughly mature them than they usually get in Tasmania.

The climate of Tasmania being cooler and less exciting than that of the neighbouring Colonies, is better fitted to bring out the good qualities of all ordinary English fruits, and thence Tasmania-grown apples and pears are better flavoured as a rule, and are endowed with better keeping qualities.

Provided a payable market can be obtained, there is practically no limit to the quantity of fruit that could be produced in Tasmania. The cooler climate would give her an advantage in the production of fruit for export, as it would naturally possess better keeping qualities.

NEW ZEALAND.

Mr. W. de G. Reeves, Officer in Charge of the Agricultural Department, has furnished a memorandum on the fruits of New Zealand, as follows :—

The following are the answers to the questions contained in Mr. Stanhope's circular.

I. The chief fruits grown in the Colony are the Apple (*Pyrus Malus*), the Plum (*Prunus domestica*), the Pear (*Pyrus communis*).

The following are also grown, but not to the same extent: Strawberry (*Fragaria vesca*), Currants (*Ribes rubrum et nigrum*), Gooseberry (*Ribes Grossularia*), Tomato (*Lycopersicum esculentum*), Raspberry (*Rubus Idæus*), Cherry (*Prunus Cerasus*), Peach (*Persica vulgaris*); and in the north, oranges and lemons are grown in small quantities.

II. Apples last from January to September; plums from January to March; pears from February to June; strawberries from October, in the north, to December in the south; currants and gooseberries during November and December; tomatoes from end of January to April; cherries during December; peaches from February to end of March.

The Colony has no fruit to export: on the contrary, we import large quantities.

The wholesale prices are ruled by the prices obtained for the fruit imported from Australia and Tasmania, and are as follows :—

Apples	from 3*s*. to 12*s*.	per bushel	of 40lbs.
Plums	„ 6*s*. to 15*s*.	„	„
Pears	„ 10*s*. to 17*s*. 6*d*.	„	„

These prices vary according to the quality of the fruit and the season of the year.

III. Practically the Colony has no fruit to export. For the year ending March 31, 1886, the total value of New Zealand-grown fruit exported was 179*l*.

IV. All the fruits mentioned are capable of being produced in very much larger quantities than at present; in fact, the Colony ought to be able to supply all its own wants in fresh fruits as well as in jams. Fruit-growing in the Colony is in a very backward condition, but more attention is now being paid to it, and the industry under proper management and systematic cultivation will no doubt gradually become a large and profitable one, so that in course of time we may be in a position to export our surplus.

V. Every kind of fresh fruit that will stand a sea voyage from Australia, Tasmania, the South Sea Islands and the United States, such as apples, pears, plums, peaches, cherries, oranges, lemons, pine apples, cocoanuts, &c.

In an addendum to Mr. Reeves's Report, furnished by Mr. Thomas Kirk, Chief Conservator of State Forests, it is stated that—

The Vine is cultivated in many parts of the North Island, and at Nelson in the South Island. At Whangarei (North of Auckland) it is extensively grown in cold vineries: the produce realizes about one shilling (1*s.*) per lb. wholesale.

The quality of the apples and pears grown here is unexceptional both with regard to appearance and flavour. It is fully equal to the best produce of the British Islands, and vastly superior to the American and Tasmanian fruit.

The cultivation of these fruits is extending with great rapidity under the attractive prospect of exporting high-class qualities to Europe and the United States during the months when their markets are most bare. Much, however, has to be done in the way of learning the best method of packing for so long a voyage.

The Government is desirous to afford every facility for the extension of the industry, and has sanctioned the inclusion of Pomology in the course of instruction to be given in the School of Forestry and Agriculture now being established in Whangarei.

I venture to draw attention to the remarks on this subject to be found at pages 5 and 6 of a paper on the proposed School of Forestry laid before the General Assembly during its last session; also on pages 4 and 5 of the Progress Report of the State Forests Department, copies of which are forwarded herewith.

The following are the remarks to which reference is made in the previous paragraph:—

The rapid development of fruit-culture in the Colony, and the important position which it is fast attaining as a leading industry, render it most advisable that its pursuit should be encouraged as far as possible without undue interference on the part of the State. It is, therefore, proposed that the school should afford facilities for acquiring a comprehensive knowledge of pomology, in addition to forestry and agriculture. Instruction in this important branch of industry may be given without any increase in the cost of the teaching-staff.

* * * * * *

The proper training of youth as fruit-growers necessarily includes those matters generally recognized by intelligent settlers as essential to success in fruit-cultivation, the preparation of the soil, and its adaption to the requirements of the particular kind of plant in question; planting, as distinct from "sticking a plant in the soil"; heading down in the early stages; summer and winter pruning, &c.; but these subjects, great as their importance may be, are less important than others which, at present, have received but little attention.

Of these, one of the most important is the selection of suitable stocks. Except in a single direction this subject is entirely neglected in the Colony. Its importance is capable of easy illustration: a few years ago apple-cultivation was in danger of becoming unprofitable in all the Australian Colonies, owing to the ravages of the American blight; when it was discovered that the Majetin, Northen Spy, and a few other kinds were rarely attacked by the insect, and, even when attacked, they suffered but little. This led to experiments with these blight resisting kinds as stocks for more susceptible varieties; and the experiments proved successful.

* * * * * *

The peach affords an instance of almost equal value. Had the ordinary European plan of working this fruit on the Mussel stock been adopted in the Australian Colonies, we should have escaped the terrible destruction which has overtaken the trees during late years, and they would have been able to endure unfavourable seasons without any serious results. No more striking instance of this could be required than was to be seen in an Auckland nursery, where the only trees in good health, not excepting seedlings a few inches in height, were two imported plants worked on the Mussel stock.

* * * * * *

Another important subject, which in some districts is crippling the fruit industry and reducing the yield to a point which affords no profit, is the prevalence of fungoid and insect pests. I need not insist here upon the extent of the injuries arising from these causes, but will direct attention to the advantages to be derived from a course of training that would enable the fruit-grower to recognize the different kinds when they make their first appearance, and teach him the lines upon which they can be most successfully encountered.

A subject entirely neglected by colonial fruit-growers at present, but which must receive a large amount of attention before New Zealand-grown fruits can take their proper place in the markets of America and Europe, is that of packing. The wealthy cities of Great Britain, the Continent of Europe, and the United States, will be the most profitable customers of colonial fruit-growers; but not until they have learned to grow the best kinds, and to pack them in such a manner that injury during their transit will be reduced to a minimum. Other advantages might be mentioned; but those already stated are sufficient to indicate the benefit to be derived by establishing a school of pomology.

Although the orchard must be looked upon as a source of revenue, and must therefore be of large extent, it will scarcely be advisable to plant the entire area to be devoted to fruit-growing at once. Probably to lay down five acres in fruit trees will be found as much as can be accomplished this season, and the area should be extended yearly until 100 acres are devoted to fruit-growing. After the second year most of the stocks should be grown on the school reserves, and grafted or budded by the students. This would reduce the cost of formation to a minimum, and give the students greater interest in their work. Every year the newest varieties should be introduced from Europe and America, and their adaptability to the climate of New Zealand properly tested. The school would thus become, not merely an institution for training fruit-growers, but a most efficient means of diffusing pomological knowledge and assisting an important branch of industry.

CAPE COLONY.

In a Minute addressed by the Ministers to the Governor, Mr. J. Gordon Sprigg states; "Adverting to his Excellency the Administrator's Minute of the 21st December last, forwarding a copy of a "despatch from the Right Honourable the Secretary of State for the "Colonies . . . . . and with particular regard to paragraph three "of the said despatch, relative to an application for information on "colonial fruits made by the Director of the Royal Gardens, Kew, the "Ministers beg to submit, for transmission, the returns enumerated in "the subjoined schedules."

The schedules, as received from Cape Colony, consist of tabular matter arranged in such a manner that it cannot be conveniently reproduced here. Schedules 1 and 2 are, however, given in full in the supplement to the Cape of Good Hope *Government Gazette*, April 15th, 1887. Those interested in the subject, and anxious to consult this supplement, could no doubt do so on application at the office of the Agent General for the Cape Government, 7, Albert Mansions, Victoria Street, S.W.

The substance of the information received from the Cape Government on colonial fruits for exports is given below.

The abstracts of schedule returns showing kinds and prices of fruit grown in the several divisions of Cape Colony, are published with special reference to the export of fruit. It appears from the numerous suggestions made, that before a trade in fruit can be established with Great Britain, *cheap* and *speedy* transit to coast ports, and *low* freights thence must be secured. Information has been sought as to the stage of ripeness at which the different kinds of fruits should be picked, and as to the proper method of packing. It has also been proposed that inquiry should be made into the prevailing diseases of fruit trees.

The principal fruits cultivated in Cape Colony, and likely to be suitable for export, are apples, apricots, bananas, figs, Cape gooseberries (Physalis), grapes, lemons, melons, nectarines, oranges, peaches, pears, pomegranates, plums, quinces, almonds, and walnuts. Most of these fruits could be grown in very large quantities in Cape Colony, if sufficient inducements were held out.

Apples

Are widely and generally cultivated. They are in season from January to March. The local prices vary from 4*d.* to 3*s.* per 100 in Cape Town to about 6*s.* per 100 in Humansdorp.

Apricots

Are very abundant. They are in season from December to February. The local prices vary from 3*d.* per 100 in the Robertson division to about 4*s.* per 100 in Cape Town.

Bananas.

These are confined to warm, sheltered, and well-watered divisions. They are in season nearly all the year round. The local prices vary from 1*d.* each to 6*s.* per 100.

Figs

Grow in several divisions of the Colony "to perfection." They are in season from December to April. The local prices at Worcester are 2*s.* 6*d.* to 3*s.* 6*d.* per bushel ; at Piquetberg, 6*d.* per 100; at Fort Beaufort, 9*d.* to 1*s.* 6*d.* per 100.

Cape Gooseberries

Are derived from a species of Physalis (natural order *Solanaceæ*). They are semi-cultivated and wild ; they make admirable preserve ; very abundant, and when sold, can be bought for 2*s.* per basket.

Grapes

Are more largely produced than any other fruits, and they could be shipped in the proper seasons in immense quantities. They are in season from December to March. The local prices vary considerably. At Clanwilliam, the price is 2*s.* 6*d.* per bushel ; at Malmesbury, 1*s.* 6*d.* per bushel ; at Paarl, 1*s.* per bushel. The price per pound varies from ½*d.* to 1*d.* per pound at Robertson to 3*d.* per pound at Queen's Town, and 6*d.* per pound at Albert.

Lemons

Are in season from March to October. The price locally varies from 1*s.* per 100 at Riversdale to 6*s.* per 100 at Albert.

Melons.

Are produced in large quantities. They are in season from January to April. The local prices are 2*d.* to 1*s.* each in Stellenbosch, and as high as 4*d.* to 2*s.* 6*d.* each in Cape Town.

Oranges

Are not so plentiful as some of the other fruits, and the local prices vary from 2*s.* per 100 to 7*s.* per 100.

Peaches

Are in season from January to March. They are sold locally at Robertson at 3*d.* to 9*d.* per 100; at Oudtshoorn at 6*d.* per 100; at Worcester at 2*s.* per bushel.

Pears

Of excellent quality are grown in the Albert, George, and the Oudtshoorn divisions. They are in season from January to March. The local prices are 3*s.* per bushel in the George Division, 1*s.* 6*d.* to 6*s.* per 100 in Cape Town, and 1*s.* per 100 in the Swellendam Division.

Pomegranates

Are only sparingly cultivated. The local prices are 1*s.* 6*d.* to 2*s.* per 100.

Plums

Are in season from December to February. At Worcester they are sold at the rate of 3*s.* per bushel. In the George Division at 4*s.* 6*d.* to 10*s.* per bushel. In other divisions the prices range from 9*d.* to 3*s.* 6*d.* per 100, according to quality.

Quinces

Are in season from December to March. They are said to grow wild at Riversdale. In most divisions they are abundant and obtainable at prices ranging from 1*d.* to 3*s.* per 100.

Almonds and Walnuts

Are in season from January to March. The local prices vary from 3*d.* to 9*d.* per pound.

The information supplied as regards the quantity of fruit produced in each division and available for export is of a very useful character. The following particulars relate to the circumstances of each division or district, as supplied by the Civil Commissioners, assisted by reports from fruit cultivators.

Albert Division.

The climate and soil are particularly adapted to the extended growth of the fruits specified above, except plums, oranges, and lemons. The quantity of fruit annually available for export purposes is,—apples, 5,000 bushels; apricots, 3,000; figs, 10,000; Cape gooseberries, 100; lemons, 1,000; nectarines, 1,000; oranges, 1,000; peaches, 10,000; pears, 5,000; plums, 500; quinces, 20,000.

Cathcart Division.

Apples, apricots, grapes, nectarines, peaches, pears, plums, quinces are obtainable at 1*s.* 6*d.* per 100, on the average, from January to May.

The quantity available for export is,—apples, 300 tons; apricots, 150; peaches, 300; pears, 150; nectarines, 150; plums, 100; quinces, 100.

Clanwilliam Division.

From this division large quantities of fruit are sent to other districts in the Colony. Grapes are usually sold at 2*s.* 6*d.* per bushel, and melons at 30*s.* per load. Guavas at 1*s.* 6*d.* per 100 are available from March to August.

George Division.

The fruit available for export is as follows:—Apples, 3,000 bushels; apricots, 2,000; figs, 1,000; oranges, 50,000 (in number); peaches, 1,000 bushels; pears, 5,000; plums, 500; quinces, 1,000; grapes, 3,000 baskets: the latter are sold at 2*s.* per bushel; figs at 6*s.* per bushel; apples at 3*s.* per bushel.

Humansdorp Division.

Large quantities of oranges, lemons, quinces, apples, and pears available for export.

Ladismith Division.

The fruit grown in this division is of superior quality. "The wild "plum grows luxuriantly, and [the kernel] yields an excellent oil of "great medicinal properties." Large quantities of fruit are available for export.

Malmesbury Division.

Grapes and melons are grown in large quantities; other fruits in fair quantities. Grapes are sold wholesale locally at 1*s.* 6*d.* per bushel.

Oudtshoorn Division.

It is stated in the Report that a model farm should be established in this division, and plants of choice fruit trees supplied to growers. Any quantity of grapes, oranges, lemons, peaches, figs, and quinces; a large quantity of melons, apricots, apples, and pears; and a limited quantity of plums, nectarines, pomegranates, almonds, and walnuts could be grown. Figs are sold locally at the rate of 3*d.* per 100; apricots, 6*d.* per 100; lemons, 7*s.* 6*d.* per 1,000; oranges, 20*s.* per 1,000; peaches, 6*d.* per 100.

Paarl Division.

In addition to the fruits already enumerated, it is stated that the olive, granadilla (*Passiflora edulis?*), loquat, mulberry, are also grown in this division. Guavas are sold at 1*s.* to 1*s.* 3*d.* per 100 from April to August. Cape gooseberries, 4*d.* per pound; grapes, 1*s.* per bushel; pears, 1*s.* to 1*s.* 6*d.* per 100.

Murraysburg Division.

Although late frosts, hailstorms, and drought affect the fruit supply, large quantities of peaches, apricots, pears quinces, apples, and figs are available for export. Apples, peaches, pears, apricots, and figs usually sold at 1*s.* per 100.

Piquetberg Division.

The chief items of fruits suitable for export are grapes and oranges. About 100,000 baskets of grapes and 500,000 (number) oranges would be available for this purpose. Loquats, mulberries, and chestnuts are also grown in small quantities. Figs, 6*d.* per 100; Cape gooseberries, 2*s.* per basket; lemons, 9*d.* per 100; oranges, 3*s.* 6*d.* per 100.

Queen's Town Division.

To establish a trade in fruit it is necessary that there should be a guaranteed market at more than local rates; formation of an export company; nominal railway rates and freights; and Government aid in experiments, and in securing proper accommodation on board ship.

Robertson Division.

Fruit of almost any known kind thrives to perfection. A syndicate should be formed, land purchased for fruit growing, and the work of a fruit growers' association carried out. At present there are available for export:—Apples, 8,000 pounds; apricots, 5,000; bananas, 5,000; figs, 20,000; peaches, 80,000; pears, 20,000; plums, 1,000; quinces, 60,000; grapes, 12,000,000. Apples, 6*d.* to 9*d.* per 100; grapes, ½*d.* to 1*d.* per pound; lemons, 1*s.* 6*d.* to 2*s.* 6*d.* per 100; peaches, 3*d.* to 9*d.* per 100; quinces, 1*d.* to 2*d.* per 100.

Stellenbosch Division.

Large quantities of strawberries are sent daily, throughout the whole season, to Cape Town and Kimberley. To increase a fruit trade an export company should be started with English capital. Available for export:—Apples, 100 tons; pears, 75 tons; quinces, 20 tons; melons, 150; grapes, almost any quantity; pomegranates, almost any quantity. Grapes, 1*s.* 6*d.* to 3*s.* per bushel; pears, 1*s.* to 3*s.* per 100.

Stockenstrom Division.

The following quantities available for export:—Apples, 100,000 (number); figs, 300,000; oranges, 700,000; peaches, 7,000,000; pears, 50,000; plums, 25,000; quinces, 1,000,000.

Worcester Division.

There is an unlimited quantity of exportable grapes at 2*s.* per bushel; in season from January to March. Peaches at the same price, and quinces at 1*s.* per bushel. Steamers are required fitted up with refrigerating chambers. Home duty on raisins of 7*s.* per cwt. is too heavy.

In the Albany Division the growing trade in fresh fruit with Kimberley has given rise to extended cultivation. The King William's Town Division is well adapted to the growth of oranges, pears, figs, apples, apricots, nectarines, guavas, and granadillas. In the Bathurst and Peddie Divisions, pine-apples are obtainable at prices ranging from 4*d.* to 9*d.* each in December and January.

The fruit exported from Cape Colony during the year ended 31st December 1886, consisted chiefly of raisins, 353,394 pounds of the value of 3,135*l.*, and grapes of the value of 173*l.* During the same period there were imported and entered for home consumption dried and other fruits of the value of 14,888*l.* Amongst the fresh fruit imported there are enumerated: pine-apples from Mauritius of the value of 191*l.*; bananas and pine-apples from Natal of the value of 4,524*l.*; fruit from Victoria of the value of 2,624*l.*; and cocoa-nuts from the Portuguese possessions in East Africa of the value of 306*l.*

There were received at Cape Town by rail from the several divisions, 2,389,953 pounds of fresh, and 969,810 of dried fruits during the year 1886. At Kimberley and Beaconsfield there were received by rail 2,638,539 pounds of fruit during the same period.

MAURITIUS.

The following Report on the fruits of Mauritius has been prepared by Mr. John Horne, F.L.S., Director of the Botanical Gardens and of Woods and Forests :—

The principal kinds of fruits grown in Mauritius, in order of merit, are : The banana, "Banane," *Musa*, several varieties ; the mango, "Mangue," *Mangifera indica*, many varieties ; the pine-apple, "Ananas," *Ananas sativa*, several varieties ; the litchi, "Leechee," *Nephelium Litchi ;* the longan, *Nephelium Longan ;* the alligator or avocada pear, "Avocat," *Persea gratissima ;* the strawberry, "Fraise," *Fragaria vesca*, a few varieties ; the peach, "Peche," *Persica vulgaris ;* the raspberry, "Framboise Maronne," *Rubus rosæfolius* (this plant is indigenous, it is not cultivated in Mauritius) ; the sweet sop, "Atti," *Anona squamosa ;* the cherimolia, "Chermoyer," *Anona Cherimolia ;* the "Curossol," *Anona muricata ;* the bullock's heart, "Cœur de bœuf," *Anona reticulata ;* the "Fruit de Cythère," *Spondias dulcis ;* the guava, "Goyave," *Psidium pomiferum, pyriferum, chinensis* and *Cattleyanum ;* the "Abricot de Pape," *Diospyros Kaki.* There are several other sorts of less importance than the above, as the Malay apple, carambole, mabola, &c.

The banana is ripe throughout the year. Mangoes from October to April, but most abundant in January and February. Pine-apples throughout the year, but most common in December, January, and February. The litchi, from the middle of November or beginning of December to the middle of January. The peach, from middle of November to the end of January. The other sorts follow at various times of the year.

The quantity of fruit available for export from Mauritius on an average of seasons is very small indeed. It takes about all that is grown in the island to supply its inhabitants and the vessels in the harbour.

As to the prices which rule the fruit market here, wholesale and retail, much depends on the scarcity, or otherwise, of the kind of fruit.

The best varieties of mangoes are, when fruit is abundant, retailed at from 25 cents to 50 cents of a rupee per dozen prime fruit.

Wholesale, and purchasing by the hundred fruit at a time at the orchard, the price is from one-half to three-fourths of the retail one, or from R. 1 to Rs. 3 per hundred fruit. In years of scarity the fruit is much dearer. The maximum price, wholesale and retail, just given, may then safely be taken for the minimum prices during such years.

The Indians—natives of India or their descendants—who are the fruit dealers of the Colony, do not care to purchase from the grower in this way. They prefer to purchase from him by the lump, so much for all the fruit on a tree or in an orchard. They then sell the fruit to retailers by the hundred. The litchi, longan, and some other kinds of fruit, are sold in the same way, at from 25 to 50 cents of a rupee per hundred fruit. The wholesale price being at about one-half to three-fourths of the retail one.

The banana is sold at about one-half a cent of a rupee for one fruit. The wholesale price at the plantation is from two to four fruit for a cent of a rupee.

The pine-apple is sold, in retail, at from four cents of a rupee and upwards per fruit, depending on size, quality, and abundance or scarcity of the fruit. The wholesale prices of this fruit, at the plantation, is about one-half to three-fourths of the above sums.

The fresh fruits exported from the Colony in 1885 were valued at Rs. 253. They were sent to the "Cape Colonies." But this export is said to be "not of local origin" in the Blue Book.

However, the shipping which visits the island during a year consumes, while in harbour, quantities of the fruits grown in the Colony; and a good supply is generally taken away for consumption on the voyage. I have not found means to ascertain the value of the latter.

Some bunches of bananas are, I believe, exported to Port Elizabeth; but no value is given for them in the Blue Book as *of local origin.*

Excepting cocoa-nuts, to the value of Rs. 260, that were exported to the "Cape Colonies" in 1885, there were no other dried fruits, the produce of Mauritius, exported in the year just mentioned.

The value of the confectionery made in the Colony and exported from it during 1885, was Rs. 1,085. The most of it was sent to France. The kinds are not given in the Blue Book, but they are supposed to have been mostly pickles and guava jelly.

There is room for all the kinds of fruits grown here being largely extended, even for local supply, let alone exportation.

The country enjoying a temperate climate nearest to Mauritius is the Cape of Good Hope. There tropical fruits do not grow, and there and the interior of South Africa, now opened up by railways, a large market might be obtained for fresh bananas, pine-apples, &c. I have no doubt that the existing small trade in these fruits could be extended, particularly if the Colony enjoys in future regular and rapid steam communication with the ports of South Africa; and the steamship owners grant facilities to shippers, and airy places on board the steamers to store the fruits during the voyage.

Hitherto rapid communication by steamers between Mauritius and South Africa has been intermittent; therefore, there has not been much if any encouragement to plant and grow fruits for export to Cape Ports, where tropical fruits would find a market.

But under conditions of shipping safely and fair profits on consignments a demand would soon arise. This would stimulate cultivators to grow fruits for this market. I have no doubt whatever that tropical fruits, bananas, pine-apples, &c. will readily find a market at the Cape Ports, if they be landed in good condition and sold cheaply.

Even now there is a rumour abroad among the people that the Colony is to withdraw its subsidy from the "Castle Packets Company," whose steamers run four-weekly to the Cape of Good Hope.

Thus, there is not much hope that these or other steamers will run constantly to South African ports, and consequently people are afraid to venture into growing fruit for this trade.

The withdrawal of this subsidy by Mauritius, acts like a premium to the sugar planters and tropical fruit growers of Natal; when the steamers cease to run thence to the Cape ports, Natal commands the markets of South Africa with its sugars and tropical fruits, without opposition.

As to Australia, Mauritius, I am afraid, will be too distant in point of time, to participate in the fresh tropical fruit trade with it.

Since writing the accompanying report, I learn that the "Messageries Maritimes" Company, whose steamers now go direct from Mauritius to Australia, contemplate making Mahé, Seychelles, their head quarters in these seas, and a branch steamer will carry goods and passengers from Mauritius and Bourbon to Mahé, to unite with the main line between Marseilles and Australia.

Sailing vessels are unsuitable for this trade, between Mauritius and Australia, and South Africa, the duration of their voyages being too long, and too uncertain.

Besides preserving pine-apples, hopes may be entertained that mangoes and litchis can be preserved in syrup and sent to Europe in tins, bottles, &c.

But growing fruits for such a trade does not seem as yet to have gone home to the fruit growers in the island. A gentleman, who was anxious to export preserved pine-apples to the English market, stated that he had offers of large orders for this fruit, which he declined, as he could not depend on getting the quantity of fruit he required at a reasonable price.

But it cannot be anticipated that much will be done here in exporting preserved fruit of any sort until a fruit-canning establishment is started.

This necessary connexion between the consumer of preserved fruit and the fruit grower, if properly dealt with, will supply the incitement which the latter requires: fair prices, ready cash, and a constant demand for his fruit. The cultivator would then know that he is not entering on what to him might seem a hazardous enterprise; and so also will the preserver, when the mutual connexion is understood.

Fruit growing, excepting that of mangoes, litchis, and a few other kinds, and all the fruit trade are in the hands of Indian market gardeners and traders.

If good reliable information was supplied regarding demands and the prices realized for preserved, or even fresh, tropical fruits in Europe, America, or Australia, local men might invest in the enterprises of growing, preserving, and exporting them. But we lack information from these countries on this subject. This information is the foundation stone of the subject. It should be constantly kept before the public in different ways or forms.

Then, to sum up this note, the necessary steps to develop an export trade in fresh fruits, say, between Mauritius and African ports, are:

(1.) Rapid and regular steam communication, giving reasonable facilities to shippers as regards moderate freight and good airy store-rooms, which secure accommodation on board the vessels for the fruits.

(2.) If the contract be renewed, or a new arrangement made between the Government of Mauritius and the Castle Packets Company, or the owners of any other good steamers, to carry the mails regularly between this Colony and the Cape Ports, that arrangements as regards the conditions mentioned in No. 1 be made with such owners.

(3.) At the commencement, that Government grant a bounty or bonus to the exporters of fresh fruits of over certain given quantities.

(4.) In regard to preserving colonial grown fruits in the Colony, that a bonus be also given to any responsible person or company that will start an establishment, at a convenient and suitable place, for preserving or canning fruits in the Colony, both for home consumption and export.

In the meantime, that while under the contemplated altered conditions as regards rapid communication with Australia, the fresh fruit trade with that country may be left alone, and all attention be given to establish this trade between Mauritius and the Cape Ports on a sound footing, and to start a canning establishment in the Colony.

Apples are imported at Mauritius principally from South Australia, and occasionally a few from Europe. Oranges, limes, lemons from Madagascar and Natal, the Cape of Good Hope, Seychelles, Rodriguez, and lately a few boxes from South Australia. These imports were valued at Rs. 6514 in 1885.

Great Britain, Tasmania, the continent of Europe, send us jams, jellies, marmalades, &c.

Preserved fruits, as peaches, apricots, pears, &c., in syrup, were imported in 1885 from Europe, mostly from France. But the value of these is mixed with confectionery; and it is impossible to state the value of them separately. In 1885 the value of imported confectionery was Rs. 45,055.

It may be worth noticing that we receive small quantities of ripe grapes, pears, &c., from South Africa, where at certain seasons of the year these fruits, grapes especially, abound. But such imports have, when made, and from what I have heard on the subject, hitherto been at the mercy of a ring of wholesale purchasers who combine to give their own prices. Thus import enterprise is discouraged, if not carried on at a loss, no matter what the demands of the public may be.

Dried fruits of the following sorts and values were imported during 1885 and consumed in Mauritius :—Almonds (Rs. 2201), mainly from Cape Colonies, India and France; dates (Rs. 2062) from the Cape of Good Hope, India and Muscat; figs (Rs. 16) from the United Kingdom; prunes (Rs. 948) from France; pistachio nuts (Rs. 226) from India and Johanna; raisins (Rs. 3390) from the United Kingdom, India, "The Cape" and France; walnuts (Rs. 361) from Hong Kong and France; of other all sorts (Rs. 274) from the United Kingdom, United States and France.

XXX.—SACCHARINE.

In the inaugural address of Sir Henry E. Roscoe, M.P., F.R.S., to the British Association at Manchester on the 27th August 1886, he drew attention to the chemical principles upon which organic synthesis have been affected. He stated that as soon as the chemical structure of an organic substance has been ascertained, or, in other words, as soon as chemists have carefully analysed and determined the exact constituents of a given organic substance, and the mode in which they are arranged within its molecule, there is open to them by a synthetic process or a building up of such constituents on a definite plan, to produce artificially a substance which hitherto may have only been known as naturally occurring in plants or animals. As instances, he cited the well-known synthesis of the colouring matter of madder by Graebe and Liebermann, and of indigo by Baeyer. Such artificial substances have been rendered possible by an intimate acquaintance with the successive steps by which these substances can be chemically broken up or decomposed. Hence, in a theoretical sense, a chemist should be able to produce artificially almost any substance for which, at present, we are entirely dependent upon certain plants. By a purely synthetic process, chemists may ultimately be able to produce artificial quinine, artificial theine, artificial theobromine, and artificial caffeine. If most artificial substances possessed all the therapeutic or elementary properties of the natural product, and they could be produced in such quantities and at such prices as would compete successfully with them, there is no doubt the growers of cinchona, tea, cacao, and coffee, would have some reason to be alarmed for the welfare of their particular industries. But while we may admit that theoretically it will, in most cases, be possible to produce artificial substances having the same chemical constitution as the natural products, it is very doubtful whether the chemist will, in many cases, find it a remunerative enterprise to compete with the planter. The list of naturally occurring substances which have been already displaced by those artificially produced by chemists is not a large one. But from time to time we are made acquainted with some new substances which have been discovered by chemical research, possessing properties singularly similar to those which have been hitherto obtained only from certain plants. Of those as mentioned by Sir Henry Roscoe, "the most "remarkable instance is the production of an artificial sweetening agent, "termed saccharine, 250 times sweeter than sugar, prepared by a "complicated series of re-actions from coal-tar." The discoverer of saccharine is Dr. Constantin Fahlberg.

When the announcement of this discovery was first made, followed soon after by the appearance of saccharine as an article of commerce, there naturally arose a well grounded anxiety amongst sugar planters to learn how far this new substance was likely to constitute a competitor with cane sugar. It is admitted that saccharine is now an article of commerce, and that it is anticipated that it will be largely employed for dietetic purposes. It appears to be agreed that saccharine does not undergo assimulation when taken as an article of food, and hence it may be used in cases where cane or beet sugar is forbidden. It may be safely employed, for instance, by diabetic patients and by persons suffering from gouty affections and liver complaints. Further, it is said, that one grain of saccharine is sufficient to sweeten a cup of tea or coffee, and that it is very difficult if not impossible to distinguish whether a beverage is sweetened with saccharine or cane sugar. And lastly, further it is claimed, that saccharine used in sweetmeats does not "create acidity," and in pharmacy its use will afford a wide field of usefulness. The manufacture of saccharine on the other hand, is said to be a costly process, and it cannot at present, nor is it even likely, to be sold as cheaply as sugar.

Having thus briefly summarized what is known of saccharine, it may interest those who are engaged directly or indirectly in the production of cane sugar, to learn the views of so eminent an authority as Sir Henry Roscoe, as to the probable influence of the discovery of saccharine on their particular industry. In reply to a letter addressed to him from this establishment in which it was stated that correspondents in the Colonies were anxious to learn the opinion of those best able to judge as to the future of saccharine, Sir Henry Roscoe expressed himself as follows:—

Sir HENRY E. ROSCOE, M.P., F.R.S., to ROYAL GARDENS, KEW.

10, Bramham Gardens,
Wetherby Road, S.W.,
December 3, 1887.

MY DEAR SIR,

IN reply to yours of November 28, as to the probable influence of the discovery of sacchrarine on the growers and makers of sugar cane and cane sugar, I have to say that I do not believe that saccharine is ever likely to become an article of common use like sugar. In the first place, saccharine is not a food, whilst sugar is; and in the second place, I doubt whether saccharine can be prepared at a price likely to compete with sugar.

I think that this artificial sweetening agent will, however, become a useful material in cases in which sugar cannot be employed, as in diabetes and other diseases.

It seems to me beyond the bounds of possibility that the price or production of cane sugar can be materially affected by the introduction of saccharine.

I am,
Yours truly,
(Signed) HENRY E. ROSCOE.

D. Morris, Esq.

LONDON: Printed by EYRE and SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 14.] **FEBRUARY.** **[1888.**

XXXI.—SEEDS OF HERBACEOUS PLANTS.

The following is a list of such Hardy Herbaceous Annual and Perennial Plants as have matured seeds under cultivation in the Royal Gardens, Kew, during the year 1887. These seeds are available for exchange with Colonial, Indian, and Foreign Botanic Gardens, as well as with regular correspondents of Kew. But the seeds are for the most part only available in moderate quantity and are not sold to the general public.

In the years 1885 and 1886 the list was printed as an independent publication. It has now been thought more convenient to issue it as a number of the Bulletin.

Every effort is made to correctly determine the nomenclature of the plants in the list. As far as it goes, it will serve as a record of the Herbaceous Species cultivated at Kew. It must, however, be remembered that a considerable proportion of herbaceous plants do not mature seeds in the climate of England, and these are necessarily not included in the list.

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY EYRE AND SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.

And to be purchased, either directly or through any Bookseller, from
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ADAM AND CHARLES BLACK, 6, NORTH BRIDGE, EDINBURGH; or
HODGES, FIGGIS, & Co., 104, GRAFTON STREET, DUBLIN.

1888.

Price Twopence.

RANUNCULACEÆ.

- Aconitum
  - chinense, Sieb., China.
  - Lycoctonum, L., Eur., etc.
  - — var. barbatum.
  - — var. carpathicum, Hort.
  - — var. Kusnezoffii, Reichb.
  - Napellus, L., Eur, Temp. Asia.
  - — var.
  - — var. album, Hort.
  - volubile, Pall., Siberia.
- Actæa spicata, L., Eur., Asia.
- Anemone
  - coronaria, L., S. Eur., etc.
  - decapetala, L., N. Amer.
  - multifida, Poir., N. Amer.
  - — var. Hudsoniana.
  - narcissiflora, L., Eur., etc.
  - polyantha, Don, Himal.
  - Pulsatilla, L., Eur., etc.
  - rivularis, Buchan., Himal.
  - sylvestris, L., Eur.
- Aquilegia
  - Bertolonii, Schott., Ital.
  - chrysantha, Gray, N. Amer.
  - — var.
  - — var. pale flw.
  - — var. hybrida.
  - Rauwolfii, Hort., var. aurea.
  - sibirica, Lam., Siberia.
  - — var. alba, Hort.
  - — var. Bungei, Hort.
  - vulgaris, L., Eur.
  - — var. alba, Hort.
  - — var. fl. pl.
  - — var. Kitaibelii.
  - — var. monstrosa, Hort.
- Caltha
  - palustris, L., Eur., etc.
  - — var. minor, Syme.
  - radicans, Forster, Eur., etc.
- Cimicifuga
  - fœtida, L., Eur., Siber.
  - — var. intermedia.
  - racemosa, Nutt., N. Amer.
- Clematis
  - alpina, L., Eur. alba. (Atragene alpina, L.)
  - integrifolia, L., S. Eur.
  - ochroleuca, Ait., N. Amer.
  - recta, L., Eur., etc.
  - — var. pauciflora.
- Delphinium
  - Ajacis, Reichb., S. Eur.
  - Brunonianum, Royle, Himal.
  - cheilanthum, Fisch., Siberia.
  - — var. bifidum.
  - caucasicum, L., Caucas.
  - — var. elongatum.
  - Consolida, L., Eur.
  - crassifolium, Schrad., Cauc.
  - — var. fol. rotundioribus, Regel.
  - dictyocarpum, DC., Siberia.
  - elatum, L., Eur., etc.
  - — garden varieties.
  - — var. intermedium.
  - — var. ranunculifolium.
  - — var. truncatum.
  - formosum, Boiss. et H., Armenia.
  - — var. lilacinum.
  - glabellum, Turcz., M. Baical.
  - grandiflorum, L., China, etc. (chinense, Fisch.)
  - — var.
  - hybridum, Steph., Caucas.
  - laxiflorum, DC., Siberia.
  - Maackianum, Regel., A. Minor.
  - moschatum, DC., S. Eur.
  - nudicaule, Torr. et Gr., Calif.
  - triste, Fisch., Siberia.
  - vestitum, Wall., Himal.
- Eranthis hyemalis, Salisb., Eur.
- Helleborus
  - antiquorum, A.Br.
  - colchicus, Regel, Levant.
  - fœtidus, L., Eur., etc.
  - guttatus × colchicus, hybrid.
  - intermedius, Guss., Calabria.
  - olympicus, Ldl., Olymp.
  - orientalis, Lam., Greece.
  - — var. roseus.
  - purpurascens, W. et K., Hungary.
- Isopyrum fumarioides, L., S. Eur.
- Myosurus minimus, L., Eur., etc.
- Nigella
  - damascena, L., S. Eur.
  - orientalis, L., Caucas., etc.
  - sativa, L., S. Eur.
- Pæonia
  - albiflora, Pall., China.
  - — var. candida, And.
  - — var. Reevesii, Hort.

Pæonia—*cont.*
- albiflora, var. uniflora.
- arietina, And., Orient.
- — var.
- — var. Andersoni.
- — var. byzantina, Hort.
- decora, And., Orient.
- — var. Pallasii, Hort.
- officinalis, Retz., Eur.
- — var. anemonæflora, Hort.
- — var. Sabini, And.
- tenuifolia, L., Siber.
- triternata, Pall., Taur., etc. (daurica, And.)

Ranunculus
- aconitifolius, L., Eur.
- acris, L., Eur.
- — var. Correanus.
- — var. Steveni, Bess.
- arvensis, L., Eur.
- brutius, Tenore, Italy.
- chærophyllus, L., Eur., etc.
- Cymbalaria, Pursh, N. Amer.
- falcatus, L., Eur. (Ceratocephalus falcatus, Pers.)
- Flammula, L., Eur.
- — var. pseudo-reptans, Syme.
- Lingua, L., Eur.
- maritimus, Ph., Chili.
- parviflorus, L., Eur.
- repens, L., Eur.
- Reuterianus, Boiss., S. Eur.

Ranunculus—*cont.*
- trachycarpus, F. et M.
- trilobus, Desf., Eur.

Thalictrum
- angustifolium, Jacq., S. Eur.
- — var.
- — var. nigricans.
- aquilegifolium, L., Eur., etc.
- — var. purpureum.
- Chelidonii, DC., Sikkim, 10,000 feet.
- flavum, L., Eur.
- — var.
- — var. sphærocarpum, Lej.
- glaucum, Desf., S. Eur.
- javanicum, Blume, Java.
- minus, L., Eur.
- — Indian form.
- — var. adiantifolium, Hort.
- — var. affine, (Jord.).
- — var. collinum, (Wallr.)
- — var. elatum, Regel.
- — var. flexuosum, (Bernh.).
- — var. kemense.
- — var. mucronatum.
- — var. pubescens, Schleich.
- — var. squarrosum, (Steph.)

Trollius
- asiaticus, L., Siber.
- europæus, L., Eur.
- — var.
- — var. Denayanus, Hort.

PAPAVERACEÆ.

Adlumia cirrhosa, Raf., Unit. States.

Argemone
- mexicana, L., Mexico.
- — var.
- — var. alba.

Bocconia cordata, W., China.

Chelidonium
- majus, L., Eur.
- — var. fl. pl.
- — var. laciniatum.

Corydalis
- capnoides, Pers., S. Eur.
- glauca, Pursh., Unit. States.
- — var. rosea.
- lutea, DC., S. Eur.
- racemosa, Pers., Japan.

Cysticapnos africanus, Gærtn., Asia.

Eschscholtzia
- californica, Cham., Calif.
- — var. alba.
- — cæspitosa, Brewer. (E. tenuifolia, Bth.)

Fumaria
- densiflora, DC., Eur.
- — var. (micrantha, Lag.).
- officinalis, L., Eur.
- parviflora, Lam., Eur.

Glaucium
- corniculatum, Curt., S. Eur.
- — var. rubrum, Hort.
- flavum, Crantz., Eur. (luteum, Scop.).
- fulvum, Sm., S. Eur.

Hunnemannia fumariæfolia, Sw., Calif.

Hypecoum procumbens, L., S. Eur.

Meconopsis
cambrica, Vig., Eur.
Wallichiana, Hook, Himal.

Papaver
caucasicum, Bbrst., Caucas.
dubium, L., Eur.
nudicaule, L., Alps.
— var.
orientale, L., Orient.
— var. bracteatum, (Lindl.)
— var. majus.
pilosum, Sibth., Greece.
— var.
— Heldreichii, (Boiss.)

Papaver—*cont.*
Rhœas, L., Eur.
— var. fl. pl.
— var. Hookeri, (Baker).
rupifragum, Boiss., Spain.
— var. atlanticum, Ball., G. Atlas.
somniferum, L., China, etc.
— var. from Cape.
— var. album.
— var. "Danebrog."
— var. fl. pl.
— var. setigerum, (DC.)
— var. Ranunculus flwd.
umbrosum, Hort.

Platystemon californicus, Benth., Calif.

CRUCIFERÆ.

Æthionema
heterocarpum, Gray, S. Eur.
saxatile, R.Br., S. Eur.

Alyssum
incanum, L., S. Eur.
maritimum, L., S. Eur. (Koniga maritima, R.Br.)
Wierzbeckii, Heuffl., S. Eur.

Arabis
albida, Stev., Caucas.
— var.
auriculata, Lam., S. Eur.
cenisia, Reichb., S. Eur.
hirta, Lam., Eur.
hirsuta, Scop., S. Eur.
lilacina, Schrad.
lucida, L. fil., S. Eur.
pumila, Wulf., S. Eur.
rosea, DC., Calabr.
Soyeri, R. et R., Pyrenees.
Stelleri, DC., China, etc. (A. japonica, Gray.)
Thaliana, L., Eur.

Aubrietia
deltoidea, DC., S. Eur.
— var. Bougainvillea.
— var. Campbellii.
— var. græca, (Griseb.)
— var. grandiflora.
— var. Hendersonii.
— var. hesperidiflora.
— var. macrostyla.
— var. Mooreana.
— var. olympica.
— var. purpurea.

Aubrietia—*cont.*
deltoidea, var. Richardi.
— var. taurica.
— var. violacea.
erubescens, Griseb., Greece.

Barbarea
vulgaris, R.Br., Eur.
— var. intermedia, Boreau.
— var. variegata.

Biscutella
ciliata, DC., S. Eur.
didyma, L., S. Eur.
erigerifolia, DC., Spain.

Brassica
alba, Boiss., Eur.
balearica, Rich., Ins. Balear.
campestris, L., Eur., etc. (B. chinensis, L.)
— var. cernua, (Thunb.)
— var. serotina.
— var. Shantung Cabbage.
Cheiranthus, Vill., S. Eur.
elata, Ball., N. Afr.
Eruca, L., S. Eur.
Erucastrum, Vill., S. Eur.
nigra, Koch, Eur.
mesopotamica, Bernh., Mesop.
oleracea, L., Eur.
— var.
— var. capitata.
— var. capitata crispa.
— var. Jersey kale.
rugosa, Roxb., Thibet.
Tournefortii, Gouan, Spain, etc.

- Braya alpina, Sternb., Alps.
- Bunias
  - Erucago, L., S. Eur.
  - orientalis, L., Orient.
- Cakile maritima, Scop., Eur.
- Camelina sativa, Crantz, Eur., etc.
- Capsella Bursa-pastoris, Mœnch, Eur., etc.
- Cardamine
  - impatiens, L., Eur.
  - Ludoviciana, Hook., N. Amer.
  - pratensis, L., Eur., etc.
- Carpoceras sibiricum, Boiss., Siber.
- Cheiranthus Cheiri, L., Eur.
- Chorispora tenella, DC., Cauc., etc.
- Cochlearia
  - danica. L., Eur.
  - officinalis, L., Eur.
  - — var. alpina, Wats.
- Conringia perfoliata, Link, Eur.
- Diplotaxis
  - erucoides, DC., Mediter.
  - tenuifolia, DC., Eur.
- Draba
  - aurea, Vahl, Greenland.
  - borealis, DC., Isl. of St. Paul.
  - bruniæfolia, Stev., Caucas.
  - chamæjasme, Griseb., Eur.
  - fladnicensis, Wulf., Carniol.
  - frigida, Saut., Alps, Eur.
  - hirta, L., N. Eur.
  - incana, L., Eur.
  - — var.
  - lactea, Adams, Siberia.
  - lasiocarpa, Reichb., S. Eur.
  - nivalis, Lilj., Norway, etc.
  - subamplexicaulis, C. A. Mey., Siberia.
  - tridentata, DC., Caucasus.
  - verna, L., Eur., N. Amer.
- Erysimum
  - asperum, DC., N. Amer.
  - crepidifolium, Reichb., Germ.
  - incanum, Kunze, S. Eur. (Kunzeanum, Boiss.)
  - Marshallianum, Andrz., Siber.
  - rupestre, DC., Asia Minor.
  - virgatum, Roth., Germany.
- Farsetia clypeata, R.Br., S. Eur.
- Heliophila
  - amplexicaulis, L. fil., Cape.
  - araboides, Sims, Cape. (H. pilosa, Lam.)
- Hesperis matronalis, L., Eur., Siber.
- Hymenophysa pubescens, Mey., Siber.
- Iberis
  - amara, L., Eur.
  - Forestieri, Jord., France.
  - Garrexiana, All., Pyrenees.
  - Lagascana, DC., Spain.
  - Pruiti, Tineo, Sicily.
  - umbellata, L., S. Eur.
  - — var. carnea.
- Isatis
  - tinctoria, L., Eur., etc.
  - virens, Hort.
- Lepidium
  - cordatum, Willd., Siber.
  - graminifolium, L., S. Eur.
  - latifolium, L., Eur.
  - Matau, Petrie, N. Zealand, 6,000 ft.
  - Menziesii, DC., N. Amer.
  - repens, Boiss., Orient, etc.
  - spinosum, L., Orient.
  - virginicum, L., N. Amer.
- Lunaria rediviva, L., S. Eur.
- Malcolmia
  - africana, R.Br., S. Eur., N. Afr.
  - Chia, DC., Greece.
  - maritima, R.Br., S. Eur., etc.
- Matthiola
  - bicornis, DC., Greece.
  - incana, R.Br., Medit.
  - tricuspidata, R.Br., Medit.
- Moricandia
  - arvensis, DC., Eur., etc.
  - sonchifolia, Hk. fil., China (Orychophragmus sonchifolius, Bunge.)
- Peltaria alliacea, L., Italy, etc.
- Pteroneuron græcum, DC., Greece, etc.
- Rapistrum Linnæanum, All., Eur.
- Schizopetalum Walkeri, Sims., Chili.
- Sisymbrium
  - Alliaria, Scop., Eur.
  - Assoanum, R. et P., Aragon.
  - austriacum, Jacq., S. Eur.
  - officinale, Scop., Eur.
  - strictissimum, L., Eur.
  - Villarsii, Jord., France.
- Succowia balearica, DC., Balearic Isles.
- Thlaspi
  - arvense, L., Eur.
  - latifolium, Bbrst., Caucasus.
  - perfoliatum, L., Eur., Caucas.
- Vesicaria cretica, Poir., Crete.

RESEDACEÆ.

- Reseda
  - alba, L., S. Eur.
  - complicata, Bory., Spain.
  - glauca, L., Spain, etc.
- Reseda—*cont*,
  - lutea, L., Eur.
  - Luteola L., Eur.
  - mediterranea, L., N. Afr.

CISTINEÆ.

- Cistus
  - albiflorus, Hort.
  - hirsutus, Lam., Mediter.
  - laurifolius, L., France, Spain.
  - platysepalus, Sweet.
  - villosus, L., Mediter.
  - — var. albicans.
- Helianthemum
  - leptophyllum, Dunal., Eur.
  - niloticum, Pers., S. Eur., N. Afr.
- Helianthemum—*cont*.
  - polifolium, Mill., Eur.
  - Fumana, Mill.
  - Tuberaria, Willd., Eur.
  - vulgare, Gærtn., Eur.
  - — var.
  - — var. roseum, DC.
  - — var. rhodanthum, (Dunal.)
  - — var. tomentosum, (Dunal.)

VIOLARIEÆ.

- Viola
  - canina, L., Eur., N. Amer.
  - — var. alba.
  - elatior Fries., Eur.
  - Delabordii, Hort.
  - Jooi, Janka, Transylv.
  - lutea, Huds., Eur.
  - — var. grandiflora.
  - mirabilis, L., Eur.
  - odorata, L., Eur.
  - — var.
  - — var. purpurea, Caucas.
  - palustris, L., Eur.
  - Patrinii, DC., India, etc. (V. primulifolia (Lour.) V. chinensis, Don.)
- Viola—*cont*.
  - pinnata, L., Alps, Eur., etc.
  - pumila, Willd., S. Eur.
  - pyrenaica, Ram., Pyrenees.
  - stagnina, Kit., Eur.
  - striata, Ait., N. Amer.
  - suavis, Bbrst., Siber.
  - sylvatica, Fries., Eur.
  - — var. alba.
  - — var. Reichenbachiana, (Bor.)
  - tricolor, L., Eur.
  - — var. maxima.

CARYOPHYLLEÆ.

- Arenaria
  - balearica, L., Balearic Isles.
  - graminifolia, Schrad., S. Eur.
  - — var. multiflora.
  - — var. parviflora.
  - gypsophiloides, Schreb., Orient.
  - fasciculata, Gouan, Eur. (Alsine Jacquinii, Koch.)
  - laricifolia, L., Eur.
- Arenaria—*cont*.
  - norvegica, Gunn., Eur.
  - pinifolia, Bbrst., Caucas.
  - tenuifolia, L., Eur.
- Cerastium
  - arvense, L., Eur.
  - — var.
  - — var. grandiflorum.
  - chloræfolium, F. et M., Anatolia.

- Cerastium—*cont.*
  - frigidum, Bbrst., Caucas.
  - — var. collinum.
  - manticum, L., S. Eur.
  - tomentosum, L., Eur.
  - vulgatum, L., Eur., N. Amer., etc.
- Cucubalus baccifer, L., Eur.
- Dianthus
  - arenarius, L., Eur.
  - Balbisii, Ser., Eur.
  - chinensis, L., China.
  - — var.
  - — var. Heddewigii.
  - cæsius, Sm., Eur.
  - — var.
  - caryophyllus, L., S. Eur.
  - cruentus, Griseb., S. Eur.
  - deltoideus, L., Eur.
  - hirtus, Vill., S. Eur.
  - glacialis, Haenk., Alps.
  - petræus, W. et K., Hungary.
  - plumarius, L., Eur.
  - — var. albus.
  - — var. serotinus.
  - prolifer, L., Eur., Siber.
  - Requienii, G. et G., S. Eur.
  - sanguineus, Vis., Alps, etc.
  - Seguieri, Vill., Eur.
  - suffrutescens, Willd., Crete.
- Gypsophila
  - acutifolia, Fisch., Cauc.
  - paniculata, L., Siberia.
  - repens, L., Eur.
  - Rokejeka, Del., Egypt.
  - scorzonerifolia, Ser., Tauria.
  - trichotoma, Wender., Siber.
- Lepigonum azoricum, Kindb., Azores.
- Lychnis
  - altaica, Fisch., Altai.
  - chalcedonica, L., E. Eur., etc.
  - — var. alba.
  - Coronaria, Desv., S. Eur.
  - diurna, Sibth., Eur.
  - Flos-jovis, Desv., S. Eur.
  - Githago, Lam., Eur. (Agrostemma Githago, L.)
  - Haageana, Lemaire.
  - — var. hybrida.
  - læta, Ait., S. Eur., etc.
  - oculata, Ldl., Levant.
  - — var. elegans.
  - perfoliata, L., Spain, etc.
  - pyrenaica, Berger., Pyren.
  - vespertina, Sibth., Eur.
  - Viscaria, L., Eur.
  - — var. alba.
- Sagina
  - glabra, Koch, France.
  - Linnæi, Presl, Eur.
- Saponaria
  - calabrica, Guss., Italy.
  - — var. alba.
  - ocymoides, L., Eur.
  - officinalis, L., Eur.
  - — var. fl. pl.
  - orientalis, L., Orient.
  - Vaccaria, L., Eur.
- Silene
  - alpestris, L., Alps, Eur.
  - ambigua, Camb., S. Eur.
  - Armeria, L., Eur.
  - argoi, Boiss., Eur.
  - chloræfolia, Sm., Armenia.
  - — var. swertiæfolia, (Boiss.)
  - Chouleti, Coss., Eur.
  - ciliata, Pourr., Crete.
  - clandestina, Jacq., Cape.
  - colorata, Poir., Mediter.
  - conoidea, L., Levant, etc.
  - cretica, L., S. Eur.
  - depressa, Bbrst., Caucas.
  - — var.
  - diurniflora, Kunze, Cape.
  - echinata, Otth., Italy.
  - fimbriata, Sims, Caucas.
  - firma, Caur. M.S.S.
  - Fortunei, Vis., China.
  - fusca, Link, Portugal.
  - gallica, L., Eur.
  - — var.
  - Gerardi, Guss., Eur.
  - gracilis, DC., S. Eur. (S. inflata, Sm.)
  - italica, Pers., Eur.
  - juvenalis, Del., Egypt.
  - linicola, Gmel., Germany.
  - longicilia, Otth, Portugal.
  - maritima, With., Eur.
  - — var. angustifolia, H., Kew.
  - muscipula, L., Mediter.
  - nutans, L., Eur.
  - pendula, L., Sicily, etc.
  - Persoonii, Tod. non Schott.
  - pseudo-atocion, Desf., N. Afr.
  - repens, Patrin., Siberia.
  - rubella, L., Eur., N. Afr.
  - rupestris, L., Alps, Eur.
  - Saxifraga, L., Eur.
  - Schweinfurthii, Rohrt.
  - Schafta, Gmel., Siber., etc.
  - tatarica, Pers., Tatar.
  - Vallesia, L., S. Eur.

Silene—*cont.*
vesiculifera, Gay, S. Eur.
vespertina, Retz., S. Eur.
Zawadskii, Herbich., Austria.
Spergula arvensis, L., Eur.
Spergularia
marina, Camb., Eur.
rubra, St. Hilaire, Eur.
salina, Presl., Eur.
Stellaria graminea, L., Eur.
Tunica Saxifraga, Scop., Eur.

PORTULACEÆ.

Calandrinia
compressa, Schrad., Chili.
glauca, Schrad., Chili.
— var. discolor, (Schrad.)
— grandiflora, Ldl.
linearifolia, DC., N. Amer.
micrantha, Schlecht., Mex.
pilosiuscula, DC., Chili.
speciosa, Ldl., Calif.
— var. alba.
umbellata, DC., Chili.
Claytonia
perfoliata, Don., N. Amer.
sibirica, L., N. Amer.
(C. alsinoides, Sims.)
Portulaca
oleracea, L., China, etc.
— var. grandiflora, vars.
papulosa, Schlecht.
pilosa, L., N. Amer.
rostellata, Brign., Brazil.
Spraguea umbellata, Torr., Calif.
Talinum patens, Willd., Mexico.

HYPERICINEÆ.

Hypericum
Androsæmum, L., Eur.
calycinum, L., Eur., etc.
Coris, L., S. Eur.
delphicum, B. et H., Eur.
elatum, Ait., N. Amer.
empetrifolium, Willd., Medit.
floribundum, Ait., Canaries.
glandulosum, Ait., Madeira.
— var. variegatum.
Hypericum—*cont.*
hircinum, L., Mediter.
hyssopifolium, Willd., Iberia.
linearifolium, Vahl., Eur.
nepaulense, Chois., Nepal.
olympicum, L., Greece, etc.
perforatum, L., Eur., China.
prolificum, L., N. Amer.
pyramidatum, Ait., N. Amer.
quadrangulum, L., Eur.

MALVACEÆ.

Althæa
lavateræflora, DC., Syria.
narbonensis, Pourr., Eur.
officinalis, L., Eur.
rosea, Cav., Orient.
— var.
— var. Heldreichii, (Boiss.)
taurinensis, DC., Italy.
Anoda
hastata, Cav., N. Amer.
Wrightii, Gray, Mexico.
Callirhoe pedata, Gray, N. Amer.
Hibiscus Trionum, L., Cosmopol.
(H. africanum, Hort.)
Kitaibelia vitifolia, Willd., Austria.
Lavatera arborea, L., S. Eur., N. Afr.
Olbia, L., S. Eur.
thuringiaca, L., Eur., etc.
trimestris, L., Mediter.
— var. alba.
Malope
trifida, Cav., N. Afr.
— var. alba.
Malva
Alcea, L., Eur.
— var. Morenii, (Poll.)
cretica, Cav., S. Eur.

- Malva—*cont.*
  - crispa, L., Eur.
  - — Garden var.
  - Duriæi, Spach., Eur.
  - limensis, L., Peru.
  - parviflora, L., Eur.
  - rotundifolia, L., Eur.
  - sylvestris, L., Eur., etc.
  - — var. mauritiana, (L.) (M. sinensis, Cav.)
  - verticillata, L., Eur. (M. glomerata, Hort.)
- Modiola multifida, Mœnch, N. Amer. (M. caroliniana, Hort.)
- Palavia malvæfolia, Cav., Lima.
- Pavonia hastata, Cav., Amer.
- Sidalcea
  - candida, Gray, N. Amer.
  - humilis, Gray, N. Amer.
  - malvæflora, Gray, N. Amer. (S. oregana, Gray.)
- Sida Napæa, Cav., N. Amer.
- Sphæralcea rivularis, Torr., N. Amer.

LINEÆ.

- Linum
  - alpinum, L., Eur. (Leonii, Schultz.)
  - angustifolium, L., Eur.
  - — var. agreste, (Brot.)
  - catharticum, L., Eur.
  - corymbulosum, Reichb., Greece.
  - grandiflorum, Desf., Algiers.
- Linum—*cont.*
  - narbonense, L., S. Eur.
  - perenne, L., Eur., etc.
  - — var.
  - — Lewisii, (Mhlbrg.)
  - tenue, Desf., Algiers.
  - usitatissimum, L., Eur.
  - — var. album.

GERANIACEÆ.

- Erodium
  - alpinum, L'Herit., Greece, etc.
  - cicutarium, L'Herit., Eur.
  - glauco-virens, Hort.
  - gruinum, Willd., S. Eur.
  - malacoides, Willd., S. Eur., etc.
  - macradenium, L'Herit., Alps.
  - Manescavi, Coss., Pyrenees.
  - pelargoniflorum, B. et K., As. Minor.
  - trichomanefolium, L'Herit., Leban.
- Geranium
  - armenum, Boiss., Orient.
  - bohemicum, L., Eur.
  - carolinianum, L., N. Amer.
  - collinum Steph., Russia.
  - — var. longipes.
  - dissectum, L., Eur.
  - Endressi, Gay, Pyrenees.
  - gracile, Schrad., Siberia.
  - gymnocaulon, DC., Caucas.
  - ibericum, Cav., Caucas.
  - Londesii, Fisch., Siber., etc.
  - — var.
  - nodosum, L., France, etc.
- Geranium—*cont.*
  - palustre, L., Eur.
  - phæum, L., Eur.
  - pratense, L., Eur.
  - — var. album.
  - pusillum, L., Eur.
  - Richardsonii, F. et M., N. Amer.
  - sanguineum, L., Eur.
  - — var. lancastriense, (With.)
  - striatum, L., Italy.
  - sylvaticum, L., Eur.
  - trilophum, Boiss., Orient.
  - Vlassovianum, DC., Dahur., etc.
  - Wallichianum, Sweet, Himal.
  - — var.
- Impatiens
  - parviflora, DC., Siberia, etc.
  - Roylei, Walp., Himal.
  - — var.
  - tricornis, Wall., Ind.
- Oxalis
  - Acetosella, L., Eur., etc.
  - corniculata, L., Eur.
  - — var. fol. purpureis.
  - corymbosa, DC., Mauritius.

Tropæolum
adunceum, Sm., Peru., etc.
(T. peregrinum, Jacq.)
(T. canariense, Hort., Engl.

Tropæolum—*cont.*
majus, L., Peru.
— var.
— Lobbianum.

RUTACEÆ.

Dictamnus
albus, L., W. Eur., Jap.
(D. Fraxinella, Pers.)
— var. purpureus.

Ruta
graveolens, L., S. Eur.
— var. divaricata.

SIMARUBEÆ.

Cneorum tricoccum, L., S. Eur.

LEGUMINOSÆ.

Adesmia muricata, DC., Chili, Patag.
Amphicarpæa monoica, Ell., N. Amer.
Anthyllis
montana, L., Eur.
Vulneraria, L., Eur.
— var. Dillenii, Schult.
Astragalus
aduncus, Willd., Caucas.
ægyptiacus, Spr., Egypt.
alopecuroides, L., Siber., etc.
bœtica, L., Spain, Sicily.
chinensis, L., China.
chlorostachys, Ldl., Himal.
Cicer, L., Eur.
falcatus, Lam., Siberia.
glycyphyllus, L., Eur.
Hypoglottis, L., Eur.
— var. albus.
Onobrychis, L., Eur., Siber.
pannosus, Fenz., Taur., etc.
stipulatus, Don., Nepal.
sulcatus, L., Siber., Taur.
thianshanicus, Regl., Turkes.
Baptisia
australis, R. Br., N. Amer.
— var. exaltata, (Sweet.)
— var. versicolor, (Lodd.)
Cicer
arietinum, L., India, etc.
songaricum, Steph., Caucas.

Coronilla
vaginalis, Lam., S. Eur.
varia, L., Eur.
Cytisus
biflorus, L'Herit., Eur.
capitatus, Jacq., Eur.
purpureus, Scop., S. Eur.
uralensis, Ledeb., Russia.
Dalea lagopus, Willd., Mexico.
Desmodium canadense, DC., N. Amer.
Dorycnium
herbaceum, Vill., S. Eur.
intermedium, Ledeb., Caucas.
rectum, Ser., S. Eur.
Ervum Lens, L., Eur., etc.
Galega
officinalis, L., Eur.
orientalis, Lam., Orient.
— var.
Genista
elata, Wendl., Eur.
sagittalis, L., Eur.
tinctoria, L., Eur.
— var.
Glycyrrhiza
echinata, L., Taur., etc.
glabra, L., S. Eur.
— var.
Hedysarum
boreale, Nutt., N. Amer.
coronarium, L., S. Eur.

Hedysarum—*cont.*
coronarium, var. album.
denticulatum, Regel.
flexuosum, L., As. Minor.
microcalyx, Baker, Himal.
neglectum, Ledb., Altai.
obscurum, L., Eur.

Lathyrus
angulatus, L., S. Eur.
Aphaca, L., Eur.
articulatus, L., S. Eur.
aureus, Benth. et Hook., Taur.
(Orobus aureus, Stev.)
Clymenum, L., S. Eur.
(O. Jordani, Tenore.)
filiformis, Gay.
lathyroides, B. et H., Siber.
(O. lathyroides, L.)
latifolius, L., Eur.
— var. ensifolius, (Badaro.)
luteus, B. et H., Asia Minor.
(O. luteus, L.)
macrorrhizus, Wimm,. Eur.
niger, Wimm., Eur.
(O. niger, L.)
Ochrus, L., Eur.
odoratus, L., Sicily, etc.
pisiformis, L., Siberia, etc.
rotundifolius, Willd., Caucas.
sativus, L., Eur.
— var. albus.
sphæricus, Retz., Eur.
sylvestris, L., Eur.
tenuifolius, Desf., Eur., etc.
tingitanus, L., N. Afr.
— var. atropurpureus.
tuberosus, L., Eur.
variegatus, B. et H., Pyrenees.
(O. variegatus, Lap.)
varius, B. et H., S. Eur.
(O. varius, Sims.)
venosus, Muhl., N. Amer.
— var.

Lotus
corniculatus, L., Eur.
major, Scop., Eur.
tenuis, W. et K., Eur., etc.

Lupinus
angustifolius, L., S. Eur.
arboreus, Sims, N. Amer.
— var.
Cosentini, Guss., Greece, etc.
densiflorus, Benth., Calif.
elegans, H. B., Mexico.
luteus, L., France, etc.
micranthus, Dougl., N. Amer.

Lupinus—*cont.*
nanus, Dougl., N. Amer.
nootkatensis, Don, N. Amer.
pilosus, L., S. Eur.
polyphyllus, Ldl., N. Amer.
— var.
— var. densus.

Medicago
apiculata, W., Eur.
(Berteroana, Mor.)
Aschersoniana, Urban, N. Afr.
Blanchiana, Boiss., Syria.
denticulata, Willd., Eur.
Echinus, DC., S. Eur.
falcata, L., Eur.
Hornemanniana, Pers., Eur.
lappacea, Desr., S. Eur.
lupulina, L., Eur.
muricata, All., Eur.
orbicularis, Willd., S. Eur.
rugosa, Desr., Eur.
rigidula, Lam., S. Eur.
sativa, L., Eur.
— var. versicolor, Ser.
scutellata, Lam., Eur., etc.
Terebellum, Willd., S. Eur.
tribuloides, Lam., S. France.

Melilotus
alba, Desr., Eur.
officinalis, Desr., Eur.
parviflora, Lam., Eur.

Onobrychis sativa, Lam., Eur.

Ononis
arvensis, Auct., Eur.
rotundifolia, L., Eur.
spinosa, L., Eur., etc.
— var. alba.

Ornithopus repandus, Poir., S. Eur.

Oxytropis
campestris, DC., Eur.
fœtida, DC., Alps, Eur.
ochroleuca, Bunge, Siber.

Phaseolus
capensis, Thunb., Cape.
(P. caffer, Haberl.).
lathyroides, L., Jamaica.
multiflorus, Lam.
— var.
Mungo, L., India.
Ricciardianus, Ten.
vulgaris, L., India.
— var. alba.
— var. fructo-rubra.
Willmotianus, Mart.

Pisum
Jombardi, Schrank.
sativum, L., Eur.
— var. quadratum, Mill.
— var. Ahebaicum.
Psoralea
macrostachya, DC., N. Amer.
orbicularis, Ldl., N. Amer.
physodes, Dougl., N. Amer.
Sewerzowia turkestanica, R. et S., Turkest.
Scorpiurus
subvillosa, L., Mediter.
sulcata, L., Mediter.
Tetragonolobus
conjugatus, Link., France.
purpureus, Mœnch, S. Eur.
Thermopsis
lanceolata, R. Br., Siberia.
montana, Nutt., N. Amer. (fabacea, DC.)
Trifolium
Alexandrinum, L., Egypt.
Cherleri, L., S. Eur.
hybridum, L., Eur.
Lagrangei, Boiss., Orient.
medium, L., Eur.
minus, Sm., Eur.
pannonicum, L., Eur., etc.
Perreymondi, Gren., France.
pratense, L., Eur.
repens, L., Eur.
— var. fol. atropurpureis.

Trifolium—*cont.*
repens, var. erubescens.
resupinatum, L., S. Eur.
rubens, L., Eur.
striatum, L., Eur.
suffocatum, Sm., S. Eur., etc.
vesiculosum, Savi, S.Eur., etc.

Trigonella
cœrulea, Lam., Eur., Caucas.
corniculata, L., S. Eur.
fœnum-græcum, L., S. Eur.
hamosa, L., Orient.

Vicia
amphicarpa, Dorth., France.
bœtica, Fisch., Siberia.
calcarata, Desf., Algiers.
cinerea, Bbrst., Caucasus.
disperma, DC., France.
Ervilia, Willd., S. Eur.
Faba, L., cultivated.
hirsuta, Koch., Eur.
narbonensis, L., S. Eur.
Orobus, DC., Eur.
pannonica, Jacq., Eur.
pyrenaica, Pourr., Pyren.
sativa, L., Eur., etc.
— var. Morisiana, (Jord.)
sepium, L., Eur.
sitchensis, Bong., N. Amer. etc. (V. gigantea, Hook.)
sylvatica, L., Eur.
villosa, Roth., S. Eur.

ROSACEÆ.

Acæna
argentea, Ruiz et Pavon, Chili.
microphylla, Hk. fil., N. Zealand.
myriophylla, Ldl., Chili.
ovalifolia, Ruiz et Pavon, Peru (Ancistrum repens, Vent.)
sanguisorbæ, Vahl., New Zeal.
Agrimonia
Eupatoria, L., Eur., etc.
odorata, Mill., Eur.
Alchemilla
alpina, L., Eur.
argentea, Don., Eur. (conjuncta, Bab.)
arvensis, Lam., Eur.
vulgaris, L., Eur.
— var. hybrida. (Pers.) (A. montana, Willd.)

Dryas
octopetala, L., Eur. Amer.
— var. Drummondii, Wats.
Fragaria
indica, Andr., Nepal.
vesca, L., Eur., Amer.
— var. monophylla, Duch.
Geum
atlanticum, Desf., S. Eur. (G. sylvaticum, Pourr.)
coccineum, Sibth., S. Eur.
— var. grandiflorum.
macrophyllum, Willd., Siber.
montanum, L., Alps, Eur.
pyrenaicum, Ram., Pyrenees.
rivale, L., Eur.
strictum, Ait., N. Amer. (G.ranunculifolium, Sering.)
triflorum, Pursh, N. Amer. (Sieversia triflora, Spr.)

- Geum—*cont.*
  - tyrolense, Host, Tyrol.
  - urbanum, L., Eur., etc.
- Gillenia trifoliata, Mœnch, N. Amer.
- Potentilla
  - alchemilloides, Lap., Pyrenees.
  - ambigua, Jacq., Himal.
  - arguta, Pursh, N. Amer.
  - argyrophylla, Wall., Himal.
  - — var.
  - — var. "Gloire de Nancy."
  - — var. Macnabiana.
  - — var. Thomasii.
  - astracanica, Jacq., Siberia, etc.
  - biflora, Willd., Siberia.
  - bifurca, L., Caucas., etc.
  - collina, Wibel, Central Eur.
  - Comarum, Nestl., Eur.
  - fruticosa, L., N. T. Zone.
  - — var.
  - flagellaris, Willd., Siber.
  - grandiflora, L., Alps.
  - hirta, L., S. Eur.
  - — var.
  - montenegrina, Panc., Alps. (Buccoana, Clem. ?)
  - nepalensis, Hook., Nepal. (P. formosa, Don.)
  - nevadensis, Boiss., Spain.
  - ontopoda, Dougl., N. Amer.
  - opaca, L., Eur., etc.
  - pedata, Willd., France.
  - pennsylvanica, L., N. Amer.
  - — var. arachnoidea, Lehm. (P. arachnoidea, Dougl.)
  - pyrenaica, Ram., Pyrenees.
  - recta, L., Eur., Caucas.
- Potentilla—*cont,*
  - recta, var. Hookeriana, (Lehm.)
  - — var. laciniata.
  - — var. macrantha, (Leab.)
  - — var. Nuttallii.
  - — var. obscura (Willd.)
  - — var. palmata.
  - — var. pentaphylla, (Rich.)
  - reptans, L., Eur.
  - rupestris, L., Eur.
  - sericea, L., Siberia.
  - Sibbaldia, Haller fil., Himal. (Sibbaldia procumbens, L.)
  - viscosa, Don, Siberia.
  - Visianii, Panc., Eur.
  - Wrangeliana, Fisch., Siberia.
- Poterium
  - alpinum, Bunge, Siberia.
  - officinale, Benth. et Hook., Eur.(Sanguisorba officinalis, L.)
  - Sanguisorba, L., Eur.
  - sitchense, Wats., N. Amer. (Sang. media, L.)
- Spiræa
  - astilboides, Hort.
  - Aruncus, L., N. Amer.
  - — var. angustifolius.
  - digitata, Willd., Siber., etc.
  - Filipendula, L., Eur.
  - lobata, Jacq., N. Amer.
  - — var. purpurea. (S. palmata var. purpurea, Hort.)
  - palmata, Thunb., Japan.
  - — var. alba.
  - procumbens, Turcz., Siber.
  - Ulmaria, L., Eur., etc.
  - — var. aurea.

SAXIFRAGACEÆ.

- Astilbe
  - japonica, Miq., Japan. (Hoteia japonica, M. et D.) Spiræa japonica, Hort.)
  - — var. variegata.
  - rivularis, Don., E. Ind.
- Boykinia major, Gray, N. Amer.
- Francoa ramosa, Cav., Chili. (F. picturata, Van Houtte.)
- Heuchera
  - americana L., N. Amer.
  - hispida, Pursh, N. Amer. (H. Richardsonii, R. Br.)
- Heuchera—*cont.*
  - pubescens, Pursh, N. Amer.
  - sanguinea, Eng., N. Amer.
- Parnassia nubicola, Hook. fil., Himal.
- Saxifraga
  - altissima, Kerner, Eur.
  - aphylla, Sternb., Eur.
  - — var. leptophylla.
  - aizoides, L., Eur., etc.
  - Aizoon, L., Eur., Alps.
  - — var. Churchillii, Kern.
  - — var. Gaudinii.

Saxifraga—*cont.*
Aizoon, var. incrustata.
— var. infracta.
— var. minor.
— var. pygmæa.
— var. recta, (Lap.)
— var. rotata.
— var. rosularis, Schleich.
aretioides, Lap., Alps.
— var. primulina.
cæsia, L., Alps., Pyren.
cæspitosa, L., Eur., etc.
— var. decipiens, (Ehrh.)
— var. hirta, (Don.)
— var. sedoides, (L.)
Clusii, Gouan, Pyrenees.
(leucanthemifolia, Lap.)
Cotyledon, L., Eur., Alps.
— var. pyramidalis, (Lap.)
crassifolia L., Siber.
(Megasea crassifolia, Haw.)
— var. cordifolia, (Haw.)
crustata, Vent., Alps.
cuneifolia, L., Alps.
— var. apennina, (Bert.)
— var. subintegra.
exarata, Vill., Eur., Alps.
— var. nervosa, (Lap.)
flagellaris, Willd., Arct. Eur., etc.
— var. mucronulata, (Royle.)
Geum, L., Eur.
— var. dentata, Lond. Cat.
geranioides, L., Eur.
granulata, L., Eur.
Hostii, Tausch, Alps.

Saxifraga—*cont.*
Hostii, var.
— var. tristis.
Kolenatiana, Regel, Siberia.
lactea, Turcz., Temp. Asia.
lingulata, Bell., Marit. Alps.
— var. cochlearis, (Rchb.)
— var. lantoscana, (Boiss.)
longifolia, Lap., Pyrenees.
— var. marginata, Hort., Kew.
luteo-purpurea, Lap., Alps.
(aretioides × media.)
Malyi, Schott, Eur.
media, Gouan, Pyrenees.
muscoides, Wulf., Eur.
— var. purpurea.
— var. pygmæa, (Haw.)
nivalis, L., Eur., etc.
pennsylvanica, L., N. Amer.
Prostii, Sternb., Eur.
Rocheliana, Sternb., Bosnia.
— var. coriophylla, (Griseb.)
rotundifolia, L., Eur.
— var. repanda, (Willd.)
sponhemica, Gmel., S. Eur.
tenella, Wulf., Alps.
umbrosa, L., Eur.
— var. minor.
— var. variegata.
valdensis, DC., Savoy, Alps.

Tellima grandiflora, R.Br., N. Amer.

Tolmiea Menziesii, Torr. et Gray, N. Amer.

CRASSULACEÆ.

Cotyledon (Umbilicus Semenovii, Regel.)
Grammanthus chloræfolia, DC., Cape.
Penthorum sedoides, L., N. Amer.
Sedum
album, L., Eur.
acre, L., Eur.
— var. Maweanum.
Aizoon, L., Siberia.
Anacampseros, L., France.
anopetalum, DC., S. Eur.
amplexicaule, DC., S. Eur.
crassipes, Wall., Sikkim, 15,000 feet.
hybridum, L., Siberia.

Sedum—*cont.*
kamtschaticum, Fisch., Kamtsch.
maximum, Reichb., C. Eur.
monregalense, Balb., S. Eur.
(cruciatum, Desf.)
Middendorfianum, Max., Siber.
oppositifolium, Sims, Caucas.
— var.
populifolium, L., Siberia.
reflexum, L., Eur., etc.
Rhodiola, DC., Eur.
rubens, L., S. Eur. (Crassula rubens, L.)
spurium, Bbrst., Caucas.

- Sedum—*cont.*
  - Telephium, L., Eur.
  - trifidum, Wall., Ind. Or.
- Sempervivum
  - alpinum, G. et S., Alps.
  - arachnoideum, L., Alps.
    - (Laggeri, Hort.)
  - arvernense, Lecoq et Lamotte, Eur.
  - atlanticum, Ball et Hook., Atlas.
  - barbatulum, Schott, Eur.
  - bicolor, Hort., Eur.
  - Boissieri, Hort., Eur.
  - Boutignyanum, Bill., Pyrenees.
  - Braunii, Funck., Germany.
  - calcareum, Jord., Eur.
  - Fauconnetii, Reut., Alps.
  - fimbriatum, L. et S., Eur.
  - flagelliforme, Fisch., Siber.
  - Funckii, Braun., Austria.
  - Greenii, Baker, Eur.
  - glaucum, Tenore, Italy.
    - (S. violaceum, Hort.)
- Sempervivum—*cont.*
  - grandiflorum, Haw.
  - Hausmannii, Hort., Eur.
  - hirtum, L., Alps.
  - juratum, Jord. et Four., France.
  - Lamottei, Boreau, France.
  - Mettenianum, Lehm., Switz.
  - montanum, L., Alps.
  - pallidum, J. et F., France.
  - parvulum, J. et F., Eur.
  - Pomelii, Lamotte, Alps.
  - Reginæ-Amaliæ, H. et S., Eur.
  - Schlehani, Sch., East Eur.
  - Schnittspahnii, Lag., Eur.
  - speciosum, Lamotte, Eur.
  - tectorum, L., Eur.
  - — var. erubescens.
  - — var. triste.
  - — var. sanguineum.
  - Verlotii, Lamotte, France.
    - (S. Delassiæ, Hort.)

LYTHRARIEÆ.

- Ammania diffusa, Willd., Upper Guinea.
- Cuphea lanceolata, Ait., Mexico.
  - (C. silenoides, Nees.)
  - viscosissima, Jacq., Amer.
  - Zimapani, Roezl, Mexico.
    - (C. silenoides, var. Zimapani, Hort.)
- Lythrum
  - alatum, Pursh, N. Amer.
  - Salicaria, L., Eur.
  - — var. brachypetalum.
  - — var. roseum.
  - — var. tomentosum, (Mill.)
  - virgatum, L., Eur.

ONAGRARIEÆ.

- Circæa lutetiana, L., Eur., etc.
- Clarkia pulchella, Pursh, N. Amer.
  - — var. alba.
  - rhomboidea, Dgl., N. Amer.
    - (C. gauroides, Hort.)
- Epilobium
  - alsinifolium, Villars, Eur.
  - angustifolium L., Eur.
  - — var. album.
  - — var. major.
  - glabellum, Forst., New Zeal.
  - hirsutum, L., Eur.
  - Lamyi, Schultz, S. Eur.
  - nummulariæfolium, Cunn., N. Zeal.
  - — var. longipes.
- Epilobium—*cont.*
  - parviflorum, Schreb., Eur.
  - rosmarinifolium, Hænke, Eur.
  - — var. Fleischeri, (Hochst.)
  - — var. sericeum.
  - roseum, Schreb., Eur., etc.
  - tetragonum, L., Eur.
- Eucharidium
  - Breweri, Gray, Calif.
  - concinnum, F. et M., Calif.
  - — var. grandiflorum.
- Gaura Lindheimeri, Eng. et Gray, N. Amer.
- Lopezia coronata, Andr., Mexico.
  - (L. minuta, Hort.)

- Œnothera
  - acaulis, Cav., Chili, etc.
  - — var. taraxacifolia, (Sweet.)
  - amœna, Lehm., Calif. (Godetia amœna, Lilja.)
  - biennis, L., N. Amer.
  - — var. media.
  - bistorta, Nutt., N. Amer.
  - campylocalyx, K. et B.
  - densiflora, Ldl., Calif. (Boisduvalia densiflora, Wats.)
  - dentata, Cav., N. Amer.
  - fruticosa, L., N. Amer.
  - — var. Youngi, Hort.
  - glauca, Michx., N. Amer.
  - leptosiphon, F. et M.
  - linearis, Michx., N. Amer.
  - longiflora, Jacq., Bonaria.
  - Lamarckiana, Ser., N. Amer. (Œ. biennis var. grandiflora, T. et G.)
- Œnothera—*cont.*
  - micrantha, Hornem., N. Amer. (Sphærostigma micranthum, F. et M.)
  - — var. hirtum, F. et M.
  - missouriensis, Sims., N. Amer.
  - odorata, Jacq., Patagon. (Œ. Berteroana, Hort.)
  - pumila, L., N. Amer.
  - purpurea, Curt., N. Amer. (Godetia purpurea, Wats.)
  - quadrivulnera, Dougl., N. Amer. (G. quadrivulnera, Spach.)
  - Romanzoffii, Ledeb., N. Amer. (G. Romanzoffii, Spach.)
  - rosea, Ait., N. Amer.
  - stricta, Ledeb., Chili.
  - tenella, Cav., Chili, Amer. (G. tenella, Wats.)
  - — var. dasycarpa.
  - triloba, Nutt., N. Amer.
  - — var. rhizocarpa, Spr.

LOASEÆ.

- Grammatocarpus volubilis, Presl, Chili (Scypanthus elegans, Don.)

- Loasa
  - hispida, L., Peru.
  - lateritia, Gill. et Hook., Chili.
  - papaverifolia, H.B., Chili.
  - prostrata, Gill., Chili.
- Loasa—*cont.*
  - volcanica, Andr., New Gren. (L. Wallisii, Hort.)
- Mentzelia
  - Lindleyi, Torr. et Gray, Calif. (Bartonia aurea, Lindl.)
  - ornata, T. et G., Calif.
  - Wrightii, Gray, Calif.

CUCURBITACEÆ.

- Bryonia dioica, L., Eur.
- Cucurbita Pepo, L., India.
- Momordica Elaterium, L., S. Eur.

FICOIDEÆ.

- Mesembryanthemum
  - pinnatifidum, L. fil., Cape.
  - pomeridianum, L., Cape.
  - tricolor, Willd., Cape.
- Mesembryanthemum—*cont.*
  - tricolor, var. album.
- Tetragonia expansa, Murr., Austral., etc.

UMBELLIFERÆ.

- Ægopodium
  - Podagraria, L., Eur., etc.
  - — var. fol. varieg.
- Ammi glaucifolium, L., S. Eur.
- Anethum Sowa, Roxb., India.
- Angelica
  - dahurica, Fisch., Dahur.
  - lævis, Gay., Spain.
- Anthriscus
  - Cerefolium, Hoffm., Eur.
  - sylvestris, Hoffm., Eur.
- Apium graveolens, L., Eur., etc.
- Archangelica
  - littoralis, Agardh, Carpath.
  - officinalis, Hoffm., Eur.
- Astrantia
  - Biebersteinii, F. et M., Caucas.
  - helleborifolia, Salisb., Cauc. (A. maxima, Pall.)
  - major, L., Eur., etc.
  - — var. carinthiaca, (Hoppe.)
  - — var. pauciflora, (Berthol.)
- Bupleurum
  - Candollei, Wall., Himal.
  - falcatum, L., Eur., Asia.
  - Gerardi, Jacq., S. Eur.
  - longifolium, L., Temp., Eur.
  - ranunculoides, L., Eur.
  - rotundifolium, L., Eur.
  - semicompositum, L., S. Eur.
- Carum
  - Carui, L., Eur.
  - burjacticum, Turcz, Siber.
- Caucalis latifolia, L., Eur. (Turgenia latifolia, Hoffm.)
- Chærophyllum
  - aromaticum, Jacq., S. Eur.
  - aureum, L., Eur.
- Conioselinum Fischeri, Wimm. et Grab., Siber, etc.
- Coriandrum sativum, L., Eur., etc.
- Cuminum Cyminum, L., Egypt.
- Deweya arguta, Torr. et Gr., N. Amer. (Arracacia arguta, Hort.)
- Eryngium
  - amethystinum, L., S. Eur.
  - campestre, L., Eur., etc.
  - giganteum, Bbrst., Caucas.
  - Olivieranum, Delar. Caucas.
  - planum, L., S. Eur., etc.
  - tripartitum, Desf., S. Eur.
  - triquetrum, Vahl., Sicily.
  - Serra, Chmss., Brasil.
- Ferula
  - Ferulago, L., S. Eur., N. Afr.
  - gigantea, Hornem., S. Eur.
  - sulcata, Desf., Italy, etc.
  - tingitana, L., N. Afr.
- Fœniculum
  - virescens, Bth., Eur.
  - vulgare, Gærtn., Eur., etc.
- Heracleum
  - Panaces, L., S. Eur.
  - pubescens, Bbrst., Cauc., etc.
  - — var. gummiferum, (Willd.)
  - Sprengelianum, W.A., Ind.Or.
  - villosum, Fisch., Russia.
- Hydrocotyle vulgaris, L., Eur.
- Lagœcia cuminoides, L., Greece.
- Levisticum officinale, Koch, Eur.
- Ligusticum
  - intermedium, Hk. fil., N. Zeal.
  - pyrenaicum, Gouan., Pyren.
  - Thomsoni, Clarke, Himal.
- Molopospermum cicutarium, DC., C. et S., Eur.
- Myrrhis odorata, Scop., Eur.
- Neogaya mucronata, Regel., Siberia.
- Œnanthe
  - crocata, L., Eur.
  - gymnorrhiza, Brign., C. et S., Eur.
  - karsthia, Hacq., Carniol.
  - peucedanifolia, Poll., Eur.
- Opoponax Chironium, Koch., S. Eur.
- Peucedanum
  - dasycarpum, R. et S., Orient.
  - officinale, L., Eur.
  - Ostruthium, Koch., Eur. (Imperatoria Ostruthium, L.)
  - Petteri, Vis., Dalmatia. (P. Schottii, Hort.)
  - salsum, Steud., Russia.
  - sativum, Benth., Eur. (Pastinaca sativa, L.)
- Petagnia saniculæfolia, Guss., Sicily.
- Petroselinum
  - sativum, Hoffm., Eur.
  - — var. cordatum.
- Physospermum commutatum, Spr., Eur. (P. cornubiense, DC.)

- Pimpinella
  - magna, L., Eur.
  - peregrina, L., S. Eur., etc.
- Pleurospermum
  - Hookeri, Clarke, Himal.
  - pulchrum, Aitch. et Hemsl., Affghan.
- Ptychotis Ajowan, DC., India.
- Scandix
  - Balansæ, Reut., Orient.
  - brachycarpa, Guss., Sicily.
- Selinum
  - Candollei, DC., Nepal.
- Selinum—*cont.*
  - apioides, Bth. et Hook., S. Eur. (Cnidium apioides, Spr.)
- Seseli gummiferum, Sm., Taur., etc.
- Sium
  - lancifolium, Bbrst., Cauc., etc.
  - latifolium, L., Eur.
- Smyrnium Olusatrum, L., Eur.
- Trachymene
  - cœrulea, Graham, Austral. (Didiscus cœruleus, Hook.)
  - pilosa, Sm., Austral.

RUBIACEÆ.

- Asperula
  - galioides, Bbrst., S. Eur., Taur.
  - hexaphylla, All., Italy, etc.
  - longifolia, Sibth., Thrace, etc.
  - taurina, L., S. Eur.
  - tinctoria, L., Eur.
- Crucianella
  - ægyptiaca, L., Egypt.
  - gilanica, Trin., Persia.
  - græca, Boiss., S. Eur.
- Galium
  - agreste, Wallr., Eur.
  - aristatum, L., S. Eur.
  - boreale, L., Eur.
  - Cruciata, Scop., Eur.
  - Lapeyrousianum, Jord., Pyren.
  - lithospermifolium, Fisch., Russia.
  - maritimum, L., Eur. (G. humifusum, Bbrst.)
  - Mollugo, L., Eur.
- Galium—*cont.*
  - parisiense, L., Eur.
  - — var. leiocarpum.
  - pisiferum, Boiss., S. Eur.
  - recurvum, Reg., Greece.
  - rubrum, Scop., S. Eur.
  - saccharatum, All., Eur.
  - sub-Mollugo × verum.
  - tenuissimum, Bbrst., Cauc.
  - tricorne, With., Eur.
  - uliginosum, L., Eur.
  - verum, L., Eur.
  - verum × Mollugo.
- Phuopsis
  - stylosa, Benth. & Hook., Persia. (Crucianella stylosa, Trin.)
  - — var. coccinea.
- Rubia
  - cordifolia, L., Siberia, etc.
  - tinctorum, L., S. Eur., etc.
- Sherardia arvensis, L., Eur.

VALERIANACEÆ.

- Centranthus
  - angustifolius, DC., S. Eur.
  - microsiphon, Boiss., Grenada.
  - ruber, DC., Eur.
  - — var. albus.
- Fedia Cornucopiæ, Vahl., S. Eur.
- Valeriana
  - alliariæfolia, Vahl, Caucas.
  - montana, L., Eur.
  - officinalis, L., Eur.
  - — var. exaltata, (Mikan.)
  - — var. sambucifolia, (Mikan.)
- Valeriana—*cont.*
  - Phu, L., S. Eur.
  - — var. aureo-variegata.
- Valerianella
  - Auricula, DC., Eur.
  - carinata, Loisl., S. Eur.
  - coronata, Dufr., Medit.
  - eriocarpa, Desv., Eur.
  - hamata, DC., S. Eur.
  - Morisonii, DC., Eur., Taur.
  - Szovitsiana, F. et M., Persia.

DIPSACEÆ.

- Cephalaria
  - leucantha, Schrad., Eur.
  - procera, Fisch.et Mey., Orient.
  - tatarica, Schrad., Siberia.
- Dipsacus
  - asper, Wall., Himal.
  - ferox, Loisl., Corsica.
  - inermis, Coulter, Nepal.
  - sylvestris, L., Eur.
  - — var. Fullonum, (L.)
- Morina longifolia, Wall., Himal.
- Scabiosa
  - alpina, L., Alps.
  - arvensis, L., Eur. (Knautia arvensis, Coult.)
  - — var.
  - atropurpurea, L., Eur.
  - — var. alba.
  - australis, Wulf., S. Eur.
- Scabiosa—*cont.*
  - (S. repens, Brign.)
  - caucasica, Bbrst., Cauc.
  - — var. amœna, (Jacq.)
  - Columbaria, L., Eur.
  - graminifolia, L., Eur.
  - Grammuntia, L., S. Eur.
  - maritima, L., S. Eur.
  - orientalis, Lagas., Orient. (Knautia orientalis, L.)
  - palæstina, L., Syria, etc. (Asterocephalus palæstinus, Spr.)
  - Pterocephalus, L., Orient, etc. (Pterocephalus Parnassi, Spr.)
  - Succisa, L., Eur.
  - sylvatica, L., S. Eur. (Knautia sylvatica, Coult.)

COMPOSITÆ.

- Achillea
  - ægyptiaca, L., Orient.
  - Ageratum, L., Eur.
  - decolorans, Schrad., Eur.
  - filipendulina, Lam., Orient.
  - — var. Eupatorium, Bbrst.
  - ligustica, All., S. Eur.
  - Millefolium, L.,, Eur.
  - — var. rubrum.
  - pallescens, DC., Asia Minor.
  - Ptarmica, L., Eur.
  - — var. alpina, (L.)
  - — var. biserrata (Bbrst.)
  - tanacetifolia, All., Eur.
  - tomentosa, L., Eur.
- Actinolepis coronaria, Gray, Calif. (Hymenoxys californica, Hook.) (Bæria coronaria, Gray.) (Shortia californica, Hort.)
- Actinomeris squarrosa, Nutt., N. Amer. (A. alternifolius, DC.) (A. helianthoides, Nutt.)
- Ageratum conyzoides, L., N. Amer.
- Amellus
  - strigosus, Less., var.
  - Willdenovii, Harv., Cape. (A. annuus, Willd.)
- Ammobium alatum, R.Br., Australia.
- Anaphalis
  - margaritacea, Bth. et Hook., Amer.
  - Royleana, DC., var.
  - concolor, Royl., Ind., Or.
- Anacyclus radiatus, Loisl., S. Eur.
- Andryala lanata, L., S. Eur., etc.
- Anthemis
  - granatensis, Boiss., Spain.
  - montana, L., Eur.
  - — var. Linnæana.
  - nobilis, L., Eur.
  - — var. discoidalis.
  - tinctoria, L., Eur.
  - — var. pallida.
- Antennaria
  - dioica, Gærtn., Eur., etc.
  - — var. tomentosa.
  - — var. hyperborea, (Don.)
  - plantaginifolia, Hook., N. Amer.
- Aphanostephus
  - arkansanus, Gray, Ark.
  - ramosissimus, DC., Mexico.
  - — var.
- Arctium
  - Lappa, L., Eur. (A. mjaus, Schkuh.)

- Articum—*cont.*
  - minus, Schkuh., Eur. (Lappa minor, DC.)
  - — var. Kotschyi.
- Arnica
  - amplexicaulis, Nutt., N. Amer.
  - montana, L., Eur.
  - Chamissonis, Less., N. Amer.
- Arctotis
  - aspera, L., Cape.
  - — var. arborescens, Bot., Mag.
  - revoluta, Jacq., Cape.
  - (A. Leichtlinii, Lynch.)
  - (A. speciosa, Jacq.)
- Artemisia
  - Absinthium, L., Eur.
  - annua, L., Caucas., etc.
  - austriaca, Jacq., Eur., etc.
  - camphorata, Vill., S. Eur.
  - canadensis, Michx., N. Amer.
  - cærulescens, L., S. Eur.
  - discolor, Dougl., N. Amer.
  - Ludoviciana, Nutt., N. Amer.
  - — var. gnaphalioides, (Nutt.)
  - maritima, L., Eur., Siber.
  - Messerschmidtiana, Besser, Siber.
  - parviflora, Roxb., India.
  - rupestris, L., Siber., etc.
  - vulgaris, L., Amer., Ind. Eur., etc.
  - — var. indica.
  - — var. fol. variegata.
- Aster
  - acris, L., Eur. (Galatella acris, Nees.)
  - — var. punctatus, (DC.)
  - acuminatus, Michx., N. Amer.
  - alpinus, L., Eur.
  - Amellus, L., Eur.
  - Bigelovii, Gray, New Mexico. (A. Townshendii, Hk. fil.)
  - corymbosus, Ait., N. Amer.
  - Curtisii, T. et G., N. Amer.
  - dahuricus, Benth., Dahuria. (G. dahurica, DC.)
  - diffusus, Ait., N. Amer.
  - Drummondii, Lindl., N. Amer.
  - glaucus, T. et Gr., Rocky Mountains.
  - junceus, Ait., N. Amer. (A. laxifolius, Ldl.)
  - lævis, L., N. Amer.
  - — var.
  - linariifolius, L., N. Amer. (Diplopappus linaræfolius, L.)
- Aster—*cont.*
  - Linosyris, Bernh., Eur.
  - — var. (Linosyris vulgaris, DC.)
  - longifolius, Lam., N. Amer.
  - — var. 3, Hort., Kew.
  - macrophyllus, L., N. Amer.
  - Novi-Belgii, L., N. Amer.
  - — var. densus, Hort , Kew.
  - — var. niveus, Hort., Kew
  - — vars. 4, 7, 9, 10, 12, Hort., Kew.
  - patulus, Lam., N. Amer.
  - polyphyllus, Willd., N. Amer.
  - prenanthoides, Muhl., N. Amer.
  - pseudo-amellus, Hk. fil., Himal., 13,000 ft.
  - ptarmicoides, T. et Gr., N. Amer.
  - puniceus, L., N. Amer.
  - — var. lucidulus, Gray. (A. p. vimineus, T. et Gr.)
  - pyrenæus, Desf., Pyrenees.
  - Radula, Ait., N. Amer.
  - salicifolius, Ait., N. Amer.
  - — var.
  - Shortii, Hook., N. Amer.
  - sibiricus, L., Siberia, etc.
  - Stracheyi, Hk. fil., Himal.
  - tardiflorus, L., N. Amer.
  - — var.
  - Thomsoni, Clarke, Himal.
  - Tradescanti, L., N. Amer.
  - trinervis, Desf., Eur.
  - — var. minor. (Galatella rigida, Cass.)
  - Tripolium, L., Eur.
  - umbellatus, Mill., N. Amer.
  - — var. cornifolius.
  - Vahlii, Hook. et Arn., Falkland Isles.
  - vimineus, Lam., N. Amer. (fragilis, T. et Gr.)
- Bahia lanata, DC., N. Amer. (Eriophyllum cæspitosum, Dougl.)
- Bæria gracilis, Gray, Calif.
- Bellis sylvestris, Cyril., Medit.
- Bellium bellidioides, L., Mediter.
- Bidens
  - frondosa, L., N. Amer.
  - humilis, H.B.K., Chili.
  - leucantha, Willd., N. Amer., etc.
  - procera, Don, Arizona.

- Boltonia
  - asteroides, L'Herit. (B. glastifolia, L'Herit.)
  - incisa, Benth., Siberia. (Calimeris incisa, DC.)
- Brachycome diversifolia, F. et M., Australia.
- Buphthalmum
  - salicifolium, DC., Eur.
  - speciosum, Schreb., Eur. (Telekia speciosa, DC.)
- Cacalia
  - suaveolens, L., N. Amer.
  - tuberosa, Nutt., N. Amer.
- Calendula
  - hybrida, L., S. Eur.
  - officinalis, L., S. Eur.
  - — var. "Meteor."
- Callistephus chinensis, Nees, China.
- Carbenia benedicta, Benth., Eur.
- Carduus
  - acanthoides, L., Eur., etc.
  - cernuus, Steud., Siberia. (Alfredia cernua, Cass.)
  - stenolepis, K. et K., Siber. (A. stenolepa, R. et. K.)
- Carthamus lanatus, L., S. Eur. (Kentrophyllum lanatum, DC.)
- Cassinia fulvida, Hk. fil.
- Catananche
  - lutea, L., Italy, etc.
  - — var. alba.
- Cenia turbinata, Pers., Cape.
- Centaurea
  - alpina, L., Italy, etc.
  - atropurpurea, W. et K., Austria.
  - calocephala, Willd., S. Eur.
  - cinerea, Lam., Italy.
  - Crocodylium, L., Orient.
  - Cyanus, L., Eur.
  - cynaroides, (Less.), Pyrenees. (Rhaponticum.)
  - dealbata, Willd., Caucas.
  - helenifolia (G. et G.), S. Eur. (Rhaponticum.)
  - Jacea, L., Eur., etc.
  - macrocephala, M. et P., Armenia.
  - melitensis, L., S. Eur.
  - montana, P., Eur.
  - — var. flore albo.
  - nigra, L., Eur.
  - nigrescens, Willd., Eur.
  - obscura, Jord., Eur.
  - pulchra, (F. et M.), Caucas.
- Centaurea—*cont.*
  - rufescens, Jord., France.
  - rutifolia, S.S., Eur.
  - — var. jurineæfolia, Boiss.
  - rigidifolia, Bess, Caucas.
  - Scabiosa, L., Eur.
  - — var. alba.
  - — var. Olivieriana, (DC.)
  - — var. purpurea.
  - sonchifolia, L., Mediter.
  - Zanonii, Sebast. et Maur., Medit.
- Chænactis tenuifolia, Nutt., Calif.
- Charieis
  - heterophylla, Cass, Cape.
  - — var. rubra.
- Chrysopsis
  - pilosa, Nutt., N. Amer.
  - villosa, Nutt., N. Amer.
- Chrysanthemum
  - achilleæfolium, Bbrst., Cauc. (Pyrethrum, Bbrst.)
  - arcticum, L., Siberia. (Leucanthemum, DC.)
  - Balsamita, L., Orient. (P. Balsamita, L., Willd.)
  - — var. tomentosum.
  - carinatum, Schousb., N. Afr.
  - cinerariæfolium, Vis., Dalmatia. (P. cinerariæfolium, Trev.)
  - coronarium, L., S. Eur.
  - — var. album.
  - — var. fl. pl.
  - corymbosum, L., Eur. (P. corymbosum, Willd.)
  - hæmatomma, Lowe, Madeira.
  - latifolium, Willd., Eur. (L. latifolium, DC.)
  - Leucanthemum, L., Eur. (L. vulgare, Lam.)
  - — var. discoideum.
  - maximum, DC., Pyrenees.
  - macrophyllum, W. et K., Eur. (P. macrophyllum, Willd.)
  - Parthenium, Pers., Eur. (P. Parthenium, Smith.)
  - Parthenifolium, Pers., Eur. (P. parthenifolium, Willd.)
  - — var.
  - pinnatifidum, L. fil., Madeira.
  - roseum, Adams, Caucas. (P. roseum, Bbrst.)
  - segetum, L., Eur.
  - Tchihatcheffii (Regel), Siber. (Pyrethrum.)

- **Chrysanthemum**—*cont.*
  - uliginosum, Pers., Hungary. (P. uliginosum, W. et K.)
  - viscosum, Desf., Spain.
- Chrysogonum virginianum, L., N. Amer.
- Cichorium Intybus, L., Eur.
- Cnicus
  - altissimus, Willd., N. Amer. (Cirsium altissimum, Spr.)
  - arachnoideus, Bbrst., Caucas. (Cirsium arachnoideum, Bbrst.)
  - arvensis, Hoffm., Eur.
  - conspicuus, L., Mexico.
  - diacanthus, (DC.), Syria. (Chamæpeuce.)
  - heterophyllus, Willd., Eur. (Cirsium heterophyllum, All.)
  - lanceolatus, Hoffm., Eur. (Cirsium lanceolatum, Scop.)
  - monspessulanus, L., S. Eur. (Cirsium monspessulanum, All.)
  - munitus, Bbrst., Caucas. (Cirsium munitum, Bbrst.)
  - ochroleucus, Willd., Eur. (Cirsium ochroleucum, All.)
  - oleraceus, L., Eur. (Cirsium oleraceum, All.)
  - strictus, Tenore, Italy, etc. (Chamæpeuce stricta, DC.)
  - syriacus, Willd., Medit.
  - Wallichii, DC., Himal.
- Conyza Gouani, Willd., Canary Isls.
- Coreopsis
  - Atkinsoniana, Dougl., N. Amer.
  - auriculata, L., N. Amer.
  - coronata, Hook., N. Amer.
  - Douglasii, B. et H., Calif. (Leptosyne Douglasii, DC.)
  - lanceolata, L., N. Amer.
  - maritima, Hook., Calif. (Leptosyne maritima, Gray.)
  - senifolia, Michx., N. Amer.
  - Stillmani, B. et H., Calif. (Leptosyne Stillmani, Gray.)
  - tinctoria, Nutt., N. Amer.
  - — var. bicolor.
- Cosmos bipinnatus, Cav., Mexico.
- Cotula
  - anthemoides, L., S. Eur., Cape, etc.
  - oxyodonta, DC., Cape.
- Cousinia Hystrix, Meyer, Caucas.
- Crepis
  - aculeata, DC., Eur.
  - alpina, L., Eur.
  - biennis, L., Eur.
  - Candollei, Spr., Eur.
  - Dioscoridis, L., Eur.
  - multicaulis, Ledeb., Siber.
  - paludosa, L., Eur.
  - pulchra, L., Eur.
  - rubra, L., S. Eur.
  - setosa, Hall. fil., Eur.
  - tectorum, L. fil., Eur., Siberia.
  - virens, L., Eur.
- Cryptostemma
  - calendulaceum, R.Br., Cape.
  - — var. hypochondriacum, (R.Br.)
- Cynara
  - Cardunculus, L., Mediter.
  - Scolymus, L., Mediter.
- Dahlia
  - coccinea, Cav., Mexico. (D. Cervantesii, Lag.)
  - Merckii, Lehm., Mexico.
  - — var. (D. glabrata, Lindl.)
  - variabilis, Desf., N. Mexico. (D. rosea, Cav.)
- Dimorphotheca annua, Less, Cape. (Calendula pluvialis, L.)
- Doronicum
  - caucasicum, Bbrst., Cauc., etc.
  - Pardalianches, L., Eur.
  - — var. grandiflorum.
  - — var. minor.
  - plantagineum, L. Eur.
  - — var. excelsum., N.E., Brown. (D. "Harpur Crewe," Hort.)
- Echinops
  - chantavicus, Traut.
  - Ritro, L., S. Eur.
  - ruthenicus, Reichb., S. Eur.
  - — var.
  - sphærocephalus, L., Eur.
  - — var. giganteus.
- Emilia sagittata, DC., India. (Cacalia coccinea, Sims.)
- Erigeron
  - acre, L., Eur.
  - alpinus, L., Eur., Amer., etc
  - bellidifolius, Muhl., N. Amer.
  - glabellus, Nutt., N. Amer.
  - — var. asperus, Gray.
  - glaucus, Ker, N. Amer.
  - macranthus, Nutt., N. Amer.
  - multiradiatus, Gray, India.
  - mucronatus, DC., Mexico.

Erigeron—*cont.*
philadelphicus, L., N. Amer.
pulchellus, Regel, Turkestan.
salsuginosus, Gray, N. Amer.
(Aster salsuginosus, Rich.)
speciosus, DC., N. Amer.
(Stenactis speciosa, Ldl.)
strigosus, Muhl., N. Amer.
Eupatorium
aromaticum, L., N. Amer.
— var. melissoides, Gray.
ageratoides, L., N. Amer.
(E. Fraseri, Hort.)
cannabinum, L., Eur., Cauc.
purpureum, L., N. Amer.
Felicia tenella, Nees, Cape.
Flaveria
Contrayerba, Pers., Chili, Peru.
repanda, Lag., N. Amer.
Gaillardia
pulchella, Foug., N. Amer.
— var. lutea.
— var. maxima.
aristata, Pursh., N. Amer.
(G. Richardsoni, Hort.)
Galinsoga
brachystephana, Rgl., S. Amer.
parviflora, Cav., Amer.
Gamolepis annua, Less., Cape.
Gerbera
anandria, Schultz., Japan, China.
lanuginosa, Benth., Himal.
(Oreoseris lanuginosa, DC.)
Gnaphalium
japonicum, Thunb., Japan.
uliginosum, L., Eur.
Guizotia oleifera, DC., India.
Helenium
autumnale, L., N. Amer.
— var. pumilum, Gray.
— var. 2.
Hoopesii, Gray, N. Amer.
Bolanderi, Gray, N. Amer.
Helianthus
annuus, L., N. Amer.
debilis, Nutt., N. Amer.
— var. cucumerifolius, Gray.
decapetalus, L., N. Amer.
doronicoides, Lam., N. Amer.
giganteus, L., N. Amer.
lævigatus, T. et G., N. Amer.
occidentalis, Riddell, N. Amer.
strumosus, L., N. Amer.
Helichrysum
augustifolium, DC., Eur.
bracteatum, Willd., Austral.
— var. album.
— var. luteum.
Helichrysum—*cont.*
Buhseanum, Boiss., Persia, etc.
orientale, DC., Orient.
— var. anatolicum.
rutidolepis, DC., Austral.
Heliopsis lævis, Pers., N. Amer.
Helipterum
Manglesii, Bth., Austral.
— var. alba. (Rhodanthe Manglesii, Ldl.)
Milleri, Hort., Australia.
roseum, Benth., Australia.
(Acroclinium roseum, Hk.)
Hieracium
alpinum, L., Eur., etc.
amplexicaule, L., Eur.
(H. pulmonarioides, Vill.)
aurantiacum, L., Eur.
Auricula, L., Eur.
Blyttianum, Fries., Norway.
boreale, Fries., Eur.
— var.
cæsium, Backh., Eur.
compositum, Lap., Pyrenees.
corymbosum, Fries., Eur.
crocatum, Fries., Eur.
— var. angustifolium.
cymosum, Vill., Eur.
Dewari, Bosw., Scotland.
flexuosum, W. et K., Eur.
integrifolium, Lange, W. Eur.
juranum, Fries., Eur.
lævigatum, Willd., Bohemia.
lapsanoides, Lap., Pyrenees.
longifolium, Schleich., Switzerl.
maculatum, Sm., Eur.
murorum, L., Eur.
— var. Moëanum, Lindeb., Norway.
pallidum, Biv., Eur.
Pilosella, L., Eur.
pratense, Tausch, Eur.
prenanthoides, Vill., Eur.
— var. riphæum, Uechtr.
ramosum, Suter., Eur. (H. rigidum, Hart.)
saxatile, Jacq., S. Eur.
staticifolium, All., Eur.
stoloniflorum, W. et K., S. Eur.
tridentatum, Fries., Eur.
umbellatum, L., Eur.
villosum, L., Eur.
vulgatum, Fries., Eur.
Hypochæris
ætnensis, Ces. et Pass., Medit.
(Metabasis ætnensis, DC.)
arachnoidea, Poir., N. Afr.
maculata, L., Eur.

- Hysterionica falcata, Willd., S., Amer. (Neja falcata, Nees.)
- Inula
  - bifrons, L., Eur.
  - britannica, L., Eur.
  - Bubonium, Jacq., Eur., etc.
  - crithmoides, L., Eur.
  - ensifolia, L., Eur., etc.
  - grandiflora, Willd., Caucas., etc.
  - glandulosa, Willd., Caucas.
  - Helenium, L. Eur.
  - hirta, L., Eur.
  - Hookeri, Clarke, Himal.
  - Oculis-Christi, L., S. Eur.
  - montana, L., Eur.
  - rhizocephala, Schrenk., Songaria, etc.
  - salicina, L., Eur.
  - thapsoides, Spr., Caucas.
  - tuberosa, Lam., Eur. (Jasonia tuberosa, DC.)
  - Vaillantii, Vill., Eur.
- Iva xanthiifolia, Nutt., N. Amer. (Cyclachæna xanthiifolia, Fres.)
- Lactuca
  - angustana, All., S. Eur.
  - cracoviensis, Buck., Eur.
  - flavida, Jord., France.
  - hastata, DC., India (Mulgedium nilgherryense, Wight.)
  - macrocarpa, (DC.), N. Amer. (Mulgedium.)
  - lactucaria, Jacq., Eur.
  - Plumieri, Gren. et Godr., S. Eur.
  - Roberowskii, Maxim., Turkestan.
  - sativa, L., Eur., Cult.
  - Scariola, L., Eur.
  - undulata, Ledeb., Siberia.
- Lapsana communis, L., Eur.
- Lasthenia Bridgesii, Steud., Chili.
- Layia
  - calliglossa, Gray, Calif.
  - Douglasii, Hook. et Arn., Calif.
  - elegans, Torr et Gr., Calif.
  - glandulosa, Hook, et Arn., Calif.
  - heterotricha, Gray, Calif. (Callichroa platyglossa, Fisch, et Mey.)
- Leontodon hispidus, L., Eur.
- Leuceria senecioides, Hook. et Arn., Chili.
- Liatris
  - cylindracea, Michx., N. Amer.
- Liatris—*cont.*
  - spicata, Willd., N. Amer.
- Lindheimera texana, Gray et Eng., Texas.
- Lonas inodora Gærtn., Sicily. (Athanasia annua, L.)
- Madia
  - filipes, Gray, S. Calif., etc. (Harpæcarpus madarioides, Nutt.)
  - sativa, Molina., Oregon., Calif.
  - — var.
  - — var. congesta, T. et Gr.
  - — var. racemosa, Gray. (M. mellosa, Jacq.)
- Marshallia
  - cæspitosa, Nutt., Texas, etc.
  - — var. foliosa.
- Matricaria
  - callosa, Sch., Eur.
  - caucasica, Benth., Caucas. (Pyrethrum caucasicum, Willd.)
  - disciformis, DC., Caucas.
  - inodora, L., Eur.
  - nigellæfolia, DC., Cape.
- Microseris linearifolia Gray, N. Amer. (Calais linearifolia, DC.)
- Myriactis
  - Gmelinii, DC., Caucas, etc.
  - Wallichii, Less., Nepal.
- Odontospermum aquaticum, Schultz., S. Eur. (Asteriscus aquaticus, DC.)
- Onopordon
  - Acanthium, L., Eur.
  - virens, DC., S. Eur., etc.
- Palafoxia
  - Hookeriana, Torr. et Gr., Texas, etc. (Polypteris Hookeriana, Gray.)
  - texana, DC., Texas. (Polypteris texana, Gray.)
- Pallenis spinosa, Cass., S. Eur.
- Parthenium integrifolium, L., N. Amer.
- Perezia multiflora, Less., Peru., etc.
- Picridium tingitanum, Desf., N. Afr.
- Picris
  - dahurica, Fisch., Dahur.
  - echioides, L., Eur. (Helminthia echioides, Gærtn.)
  - hieracioides, L., Eur.
  - — var. indica., Himal.

- Petasites vulgaris, Desf., Eur.
- Prenanthes muralis, L., Eur.
- Pyrrhopappus carolinianus, DC., Florida, Texas.
- Rodigia commutata, Spr., Crete.
- Rhagadiolus
    - creticus, All., S. Eur. (Hedypnois cretica, Willd.)
    - Hedypnois, All., Mediter. (H. polymorpha, DC.)
    - Kœlphinia, Lam., Siber. (Kœlpinia linearis, Pall.)
    - stellatus, Gærtn., S. Eur.
- Rudbeckia
    - amplexicaulis, Vahl, Texas, etc. (Dracopis amplexicaulis, Cass.)
    - californica, Gray, Calif.
    - hirta, L., N. Amer.
    - laciniata, L., N. Amer.
    - occidentalis, Nutt., Sierra Nevada, etc.
    - — var. (R. diversifolia, Hort., Engl.)
    - speciosa, Wend., N. Amer. (Newmanni, Hort.)
- Sanvitalia procumbens, Lam., Mexico.
- Saussurea
    - albescens, Hk. fil. et Th., Himal.
    - denticulata, Ledb., Siber., etc.
    - hypoleuca, Spr., Himal.
- Scolymus hispanicus, L., S. Eur.
- Senecio
    - artemisiæfolius, Pers., S. Eur.
    - aureus, D., N. Amer.
    - concolor, DC., N. Afr.
    - chrysanthemifolius, Poir., Eur., etc.
    - Doronicum, L., Eur.
    - Doria, L., Eur.
    - elegans, L., Cape.
    - — var. alba.
    - — var. purpurea.
    - Fuchsii, Gmel., S. Eur.
    - Hodgsoni, (Hook.), Japan. (Ligularia Hodgsoni.)
    - Jacquinianus, Reichb., Eur.
    - japonicus, Sch., Japan. (L. japonica, DC.)
    - Kæmpferi, DC. Japan. (L. Kæmpferi, DC.)
- Senecio
    - macrophyllus, Bbrst., Caucas.
    - quinquiculatus, Rgl., Asia Minor.
    - sarracenicus, L., Eur., etc.
    - sibiricus, Lepech., Siberia. (L. sibirica, Cass.)
    - thyrsoideus, DC., Siberia. (L. thyrsoidea, DC.)
    - viscosus, L., Eur.
- Sericocarpus solidagineus, Nees., N. Amer.
- Serratula coronata, L., Siberia.
    - — var. macrophylla.
    - Gmelinii, Ledeb., Caucas.
    - heterophylla, Desf., S. Eur.
    - quinquifolia, Bbrst., Caucas.
    - tinctoria, L., Eur.
    - — var. indivisa, Poir.
- Siegesbeckia orientalis, L., Ind., etc.
- Silphium
    - integrifolium, Michx., N. Amer.
    - laciniatum, L., N. Amer.
    - perfoliatum, L., N. Amer. (S. connatum, L.)
    - — var. conjunctum, (Willd.)
    - scaberrimum, Elliott, N. Amer.
    - terebinthinaceum, Jacq., N. Amer.
    - trifoliatum, L., N. Amer. (S. ternatum, Retz.)
- Silybum
    - eburneum, Coss. et Dur., Eur.
    - Marianum, Gærtner, Eur.
- Solidago
    - arguta, Ait., N. Amer.
    - Boottii, Hook., N. Amer.
    - bicolor, L., N. Amer.
    - — var. concolor, Torr. et Gr.
    - canadensis, L., N. Amer.
    - — var.
    - cæsia, L., N. Amer.
    - Drummondii, T. et Gr., N. Amer.
    - elongata, Nutt., N. Amer.
    - elliptica, Ait., N. Amer.
    - humilis, Pursh, N. Amer.
    - — var. Gillmani, Gray.
    - juncea, Ait., N. Amer.
    - latifolia, L., N. Amer.
    - neglecta, T. et G., N. Amer.
    - ohiœnsis, Riddell, N. Amer.
    - rigida, L., N. Amer.
    - rugosa, Mill., N. Amer.

- Solidago—*cont.*
  - sempervirens, L., N. Amer.
  - — var. viminea, Gray. (S. integrifolia, Desf.)
  - serotina, Ait., N. Amer.
  - Shortii, T. et Gr., N. Amer.
  - ulmifolia, Muhl., N. Amer.
  - Virgaurea, L., Eur., etc.
  - — var. minuta.
  - — var. pumila.
- Sonchus
  - asper, Hoffm., Eur.
  - oleraceus, L., Eur.
  - palustris, L., Eur.
- Spilanthes
  - Acmella, L., India.
  - oleracea, L., Ind., S. Amer.
- Stobaea purpurea, DC., Cape.
- Stevia
  - Eupatoria, Willd., Mexico.
  - laxiflora, DC., Mexico.
  - ovata, Lag., Mexico.
  - Plummeræ, Gray, S. Arizona.
  - — var. alba, Gray.
  - serrata, Cav., New Mexico, Arizona. (S. canescens, H.B.K.)
- Tagetes
  - glandulifera, Schrank., S. Amer.
  - Parryi, Gray, Mexico.
- Tanacetum
  - leucophyllum, Rgl., Siber.
  - vulgare, L., Eur.
  - — var. crispum.
- Taraxacum gymnanthum, DC., Greece.
- Tolpis
  - barbata, Gærtn., S. Eur.
  - virgata, Bert., S. Eur.
- Tragopogon (Geropogon glabrum, L.), S. Eur.
- Tripteris cheiranthifolia, Schultz., Abyss.
- Urospermum
  - Dalechampii, Desf., S. Eur.
  - picroides, Desf., S. Eur.
- Ursinia
  - pulchra, N. E. Brown, Cape. (Sphenogyne speciosa, Know. et West.)
  - — var. sulphurea, Hort., Kew.
  - anthemoides, Poir., Cape. (Sphenogyne anthemoides, R. Br.)
- Venidium.
  - fugax, Harv., Cape.
  - hirsutum, Harv., Cape.
- Xanthium
  - indicum, Wall., Ind., etc. (X. orientale, L.)
  - strumarium, L., Eur.
- Xanthocephalum gymnospermoides, B. et H., Amer. (Gutierrezia gymnospermoides, Gr.)
- Xeranthemum
  - annum, L., S. Eur.
  - — var. fl. pl.
  - cylindraceum, Sm., S. Eur.
  - longipapposum, F. et M., Persia.
- Ximenesia encelioides, Cav., Mexico.
- Zinnia Haageana, Regel.

CAMPANULACEÆ.

- Adenophora
  - communis, Fisch., Siber.
  - liliifolia, Bess., Hungary, etc. (A. suaveoleus, Fisch.)
- Campanula
  - alliariæfolia, Willd., Caucas.
  - barbata, L., Alps.
  - bononiensis, L., Eur., W. Asia.
  - carpathica, L. fil., Carpath.
  - — var. alba.
  - — var. turbinata, (Schott.)
  - collina, Bbrst., Caucas.
  - Erinus, L., Eur.
  - glomerata, L., Eur., etc.
  - Hohenackeri, F. et M., Orient.
- Campanula—*cont.*
  - lactiflora, Bbrst., Caucas.
  - — var. cœrulea.
  - latifolia, L., Eur., etc.
  - — var. macrantha, (Fisch.)
  - — var. versicolor, (Sib. et Sm.)
  - latiloba, DC., Olympus. (C. nobilis, Hort.)
  - Loreyi, Pall., Italy.
  - Medium, L., S. Eur.
  - — var. calycanthema.
  - persicifolia, L., Eur., etc.
  - — var. alba.
  - — var. maxima.
  - primulæfolia, Brot., Spain.

Campanula—*cont.*
  punctata, Lam., Siber., etc.
  pyramidalis, L., S. Eur.
  — var. alba.
  rapunculoides, L., Eur.
  ramosissima, S. et S., Greece.
  Reuteriana, B. et B., Orient.
  rhomboidea, L., Eur.
  rotundifolia, L., Eur.
  — var. alba. (C. Hostii, alba).
  — var. Scheuchzeri, (Vill.)
  sarmatica, Ker, Caucas.
  sibirica, L., Eur., Asia.
  Trachelium, L., Eur.
  — var. fl. pl.
  thyrsoidea, L., Eur.
Codonopsis
  ovata, Bth., Himal. (Glossocomia ovata, Don.)
  lurida, Hort., Kew.
Cyananthus lobatus, Wall., Himal.
Downingia pulchella, Torr., Calif. (Clintonia pulchella, Ldl.)
Laurentia minuta, DC., Cape.
Lobelia
  Cliffortiana, L., N. Amer.
  Erinus, L., Cape.
  — var. purpurascens.
  inflata, L., N. Amer.
  littoralis, Cum., N. Zeal.
  ramosa, Bth., N. Zeal.

Lobelia—*cont.*
  syphilitica, L., N. Amer.
  Tupa, L., Chili.
  urens, L., Eur.
Palmerella debilis, A. Gr., N. Amer.
Phyteuma
  campanuloides, Bbrst., Cauc.
  Halleri, All., S. Eur.
  Michelii, All., S. Eur.
  nigrum, Schmidt, Germ.
  orbiculare, L., Eur.
Platycodon,
  grandiflorum, A.DC., Siber.
  — var. Mariesii, Hort.
Specularia
  coa, A.DC., Eur.
  falcata, A.DC., Mediter.
  pentagonia, A.DC., Orient.
  Speculum, A.DC., Eur.
Symphyandra
  pendula, DC., Caucas.
  Wanneri, Heuff., Transyl.
Wahlenbergia
  capense, DC., Cape.
  dalmatica, A.DC., Dalmatia. (Edraianthus dalmaticus, A.DC.)
  lobelioides, DC., Madeira.
  saxicola, DC., N. Zeal.

DIAPENSIACEÆ.

Galax aphylla, L., N. Amer.

PLUMBAGINEÆ.

Acantholimon glumaceum, Boiss., Orient.
Armeria
  canescens, Boiss., Dalmatia.
  longiaristata, B. & R., Orient.
  maritima, Willd., Eur.
  — var. alba.
  — var. Laucheana.
  plantaginea, Willd., Eur.
  — var. alba.
  — var. leucantha, Boiss.
  sibirica, Turcz., Siber.
  vulgaris, Willd., Eur.
  — var. rubra.

Statice
  alatavica, Regel et Schm., Turkest.
  auriculæfolia, Vahl, Eur.
  — var. occidentalis, (Lloyd.)
  Bonduellii, Leoteb., Algeria.
  caspia, Willd., Caucas.
  diffusa, Pour., S. Eur.
  echioides, L., S. Eur., etc.
  Limonium, L., Eur.
  — var. Gmelini, (Willd.)
  — var. puberula.
  leptostachya, Boiss., Orient.
  speciosa, L., Siberia.
  Suworowii, Regel, Turkestan.
  tatarica, L., Tauria, etc.

PRIMULACEÆ.

Anagallis
- arvensis, L., Eur., etc.
- — var. carnea, Schrank.
- — var. cœrulea, (Schreb.)

Androsace
- elongata, L., Eur.
- maxima, L., Eur., Caucas.
- septentrionalis, L., Eur., etc.

Asterolinum stellatum, Link, Eur.

Coris monspeliensis, L., S. Eur.

Cortusa
- Matthioli, L., Eur.
- — var. grandiflora.

Dodecatheon
- Meadia, L., N. Amer.
- — var. splendidum.

Lysimachia
- barystachys, Bunge, Japan.

Lysimachia—*cont.*
- ciliata, L., N. Amer.
- Ephemerum, L., France, etc
- pyramidalis, Wall., Ind.
- vulgaris, L., Eur.

Primula
- elatior, Jacq., Eur.
- floribunda, Wall., Himal.
- denticulata, Sm., Ind.
- japonica, Gray, Japan.
- mollis, Nutt., Bootan.
- rosea, Royle, Ind.
- sikkimensis, Hook., Himal.
- verticillata, Forst., Arabia.

Samolus
- repens, Pers. Austral. (Sheffieldia repens, L. fil.)
- Valerandi, L., Eur.

ASCLEPIADEÆ.

Asclepias
- Cornuti, Dcne, N. Amer. (A. syriaca, L.)
- tuberosa, L., N. Amer.

Vincetoxicum
- fuscatum, Reichb., S. Eur.
- nigrum, Mœnch, Eur.
- officinale, Mœnch, Eur.

GENTIANEÆ.

Erythræa
- capitata, Willd., Eur.
- — var. sphærocephala, Towns.
- Centaurium, Pers., Eur.
- diffusa, Woods, Azores.
- linarifolia, Pers., Eur.
- pulchella, Fries, Eur.

Gentiana
- affinis, Griseb., Calif.
- asclepiadea, L., S. Eur.
- — var. alba.
- Burseri, Lap., Pyrenees.
- cruciata, L., Eur. Siber.

Gentiana—*cont.*
- lutea, L. Eur.
- Pneumonanthe, L., Eur.
- sceptrum, Griseb, N. Amer.
- septemfida, Pall., Caucas. (G. gelida, Hort.)
- — var. cordifolia.
- tibetica, King, Himal. (G. macrophylla, Hort.)
- verna, L., Eur.

Sabbatia chloroides, Pursh, N. Amer.

Sebacea pallida, Mey., S. Afr.

POLEMONIACEÆ.

- Collomia
  - coccinea, Lehm., Chili.
  - grandiflora, Dougl., N. Amer.
  - linearis, Nutt., Calif.
  - stenosiphon, Kunze, Chili, etc.
- Gilia
  - achilleæfolia, Bth., Calif.
  - androsacea, Steud., Calif. (Leptosiphon androsaceus Bth.)
  - capitata, Dougl., Calif.
  - incisa, Bth., Calif.
  - laciniata, R. et P., Chili, Peru.
  - micrantha, Steud., Calif. (L. luteus, Benth.)
  - Navarettia, Steud., Chili.
- Gilia—*cont.*
  - squarrosa, Hook. et Arn., Calif.
  - tricolor, Benth., Calif.
- Phlox
  - Drummondii, Hook., Calif.
  - paniculata, L., N. Amer.
- Polemonium
  - cæruleum, L.,Eur., Amer., etc.
  - — var. album, Hort.
  - — var. bipinnatum, Hort.
  - — var. grandiflorum, Hort.
  - — var. pulchellum, (Bunge.)
  - humile, Willd., N. Amer.
  - mexicanum, Cerv., Mexico.

HYDROPHYLLACEÆ.

- Hydrophyllum virginicum, L., N. Amer.
- Nemophila
  - atomaria, Fisch. et Mey., Calif. (Menziesii var.)
  - insignis, Dougl., Calif.
  - — var. grandiflora, Hort.
  - maculata, Bth., Calif.
  - Menziesii, Hook. et Arn., Calif. (N. discoidalis, Flore des Serres.)
  - parviflora, Dougl., N. Amer.
  - phacelioides, Nutt., N. Amer.
- Phacelia
  - campanularia, Gray, Calif.
  - congesta, Hook., Calif.
  - loasæfolia, Torr., N. Amer.
  - Parryi, Torr., Califor.
  - tanacetifolia, Bth., Calif.
  - Whitlavia, Gray, Calif. (Whitlavia grandiflora, Hort.)
  - — var. alba, Hort.

BORAGINEÆ.

- Amsinckia
  - angustifolia, Lehm., Chili.
  - intermedia, Fisch. et Mey., Calif.
- Anchusa
  - capensis, Thunb., Cape.
  - italica, Retz., S. Eur., etc.
  - officinalis, L., Eur.
  - — var. alba, Hort.
  - sempervirens, L., Eur.
- Borago
  - officinalis, L., Eur.
  - — var. alba, Hort.
  - laxiflora, DC., Mediter.
- Caccinea glauca, Savi, Persia.
- Cerinthe
  - maculata, L., Eur.
  - major, L., S. Eur.
  - minor, L., S. Eur.
  - retorta, Sib. et Sm., Greece.
- Cynoglossum
  - micranthum, Desf., China.
  - officinale, L., Eur.
  - pictum, Ait., S. Eur.
- Echium pustulatum, S. et S., S. Eur., (violaceum, L.)
- Eritrichium
  - barbigerum, Gray, Calif.
  - strictum, Dcne., Himal.

- Lindelofia spectabilis, Lehm., Himal.
- Lithospermum officinale, L., Eur.
- Myosotis arvensis, Hoffm., Eur.
    - azorica, H. C. Wats., Azores.
    - Balbisiana, Jord., Eur.
    - palustris, With., Eur.
    - — var. semperflorens, Hort.
    - sylvatica, Hoffm., Eur.
- Nonnea
    - rosea, Bbrst., Caucas. (N. versicolor, (Sweet. ?)
    - ventricosa, Griseb.
- Omphalodes linifolia, Mœnch, S. Eur.
- Symphytum
    - asperrimum, Sims, Caucas.
    - bulbosum, Schimp., S. Eur.
    - — var. Zeyheri, Schimp.
    - grandiflorum, DC., Orient. (ibericum, Stev.)
    - officinale, L., Eur.
    - — var. fol. varieg.
    - officinale × asperrimum.
    - tuberosum, L., Eur.

CONVOLVULACEÆ.

- Calystegia
    - Sepium, R. Br., Eur.
    - — var. sylvatica, (Chois.)
- Convolvulus
    - siculus, L., S. Eur.
    - tricolor, L., Medit.
    - — var. albus, Hort.
    - — var. striatus, Hort.
- Convolvulus —*cont.*
    - undulatus, Cav., Medit.
- Ipomœa
    - purpurea, Lam., N. Amer.
    - — var. cærulea, Hort.
- Nolana
    - atriplicifolia, D. Don, Peru.
    - — var. subcærulea, Hort.

SOLANACEÆ.

- Atropa Belladonna, L., Eur.
- Browallia viscosa, H. B. K., Peru (B. Czerwiakowskyana, (Rgl.)).
- Datura
    - ferox, L., Ind., China.
    - lævis, L. fil., Africa.
    - Stramonium, L., Eur.
    - Tatula, L., Eur., etc.
    - — var. gigantea, Hort., Berlin.
- Hyoscyamus
    - niger, L., Eur.
    - — var. albus, Hort.
    - orientalis, Bbrst., Cauc.
    - pusillus, L., Persia.
- Lycopersicum
    - esculentum, Mill. St. Amer. (L. Humboldtii, Dun.)
    - racemigerum, Lange, S. Amer.
- Nicandra physaloides, Gaertn., Peru.
- Nicotiana
    - acuminata, Graham, Peru.
    - acutifolia, St. Hil., Brazil.
- Nicotiana—*cont.*
    - affinis, T. Moore.
    - alata, Link., Brazil.
    - chinensis, Fisch., China.
    - fragrans, Bernh.
    - longiflora, Cav., Chili.
    - multivalvis, Ldl., Columbia.
    - paniculata, L., S. Amer.
    - plumbaginifolia, Viv., N. Amer.
    - repanda, Willd., N. Amer.
    - rustica, L., S. Eur., etc.
    - — var. Lebanon.
    - — var. Syrian.
    - — var. (Texana Hort.)
    - — var. "Bhilsa."
    - Tabacum, L., S. Amer.
    - — var. attenuata, Hort.
    - — var. "Latakia."
    - — var. "Manila."
    - — var. "Maryland."
    - — var. "Shiraz."
    - — var. "Virginian."
    - viridiflora, Lag.
- Petunia nyctaginiflora, Juss., La Plata.

Physalis
Alkekengi, L., Eur., Japan.
peruviana, L., Peru (P. edulis, Sims)
Salpiglossis sinuata, R. et P., Chili.
Schizanthus
pinnatus, R. et P., Chili.
var. albus, Hort.
Scopolia lurida, Desf., Himal.
Solanum
Dulcamara, L., Eur.
guineense, Lam., Trop. Afr., etc.
sisymbriifolium, L., S. Amer.
tuberosum, L., Chili.
— var. Maglia, (Schlecht.)
— var. black tubers.
villosum, Lam., Eur.

SCROPHULARINEÆ.

Alonsoa
incisifolia, R. et P., Peru.
Warscewiczii, Rgl., Peru.
Anarrhinum bellidifolium, Willd., S. Eur.
Antirrhinum
majus, L., Eur.
Nuttallianum, Bth., Calif.
Orontium, L., Eur.
rupestre, Boiss. et Reut., Spain.
Calceolaria chelidonoides, H.B.K., Chili.
Celsia
Arcturus, L., Crete, As. Minor.
glandulosa, Bouché, S. Eur.
cretica, L., Crete, N. Afr.
— var. grandiflora.
Chelone
glabra, L., N. Amer.
Lyoni, Pursh, N. Amer.
Collinsia
bicolor, Benth., Calif.
— var. multicolor.
grandiflora, Dougl., N. Amer.
parviflora, Dougl., N. Amer.
violacea, Nutt., N. Amer.
Digitalis
ambigua, Murr., (D. grandiflora, Lam., D. ochroleuca, Jacq.), Eur.
ferruginea, L., S. Eur.
lutea, L., S. Eur.
purpurea, L., Eur.
— var. alba, Hort.
Erinus
alpinus, L., Eur.
— albus.
Gratiola officinalis, L., Eur.
Haberlea rhodopensis, Friv., Maced.
Ianthe bugulifolia, Griseb., Turkey.
Linaria
amethystea, Hoffmg. et Link., Spain.
aparinoides, Steud., Atlas.
— var. aureo-purpurea, Regel. (L. reticulata aureo-purpurea, Hort.)
— var. splendens, Hort.
arvensis, Desf., Eur.
bipartita, Willd., N. Afr.
Broussonetii, Poir, Orient.
capraria, M. et D., Italy.
chalepensis, Mill., S. Eur.
Cymbalaria, Mill., Eur.
genistæfolia, Mill., S. Eur.
littoralis, Willd., S. Eur.
maroccana, Hk. fil., Marocco.
minor, Desf., Eur., N. Afr.
purpurea, L., Eur., etc.
repens, Mill., Eur.
saxatilis, DC., S. Eur.
spartea, Hoffm., S. Eur.
triphylla, Willd., S. Eur.
tristis, Mill., S. Eur.
vulgaris, Mill., Eur.
Mazus bicolor, Benth., Ind.
Mimulus
cardinalis, Dougl., N. Amer.
luteus, L., N. Amer.
ringens, L., N. Amer.
Nemesia
floribunda, Lehm., Cape.
pubescens, Benth., Cape.
versicolor, Meyer, Cape.
Pentstemon
acuminatus, Dougl., N. Amer.
barbatus, Nutt., N. Amer.
— var. Torreyi, Gray.
campanulatus, Willd., Mexico.
— var. roseus, Hort.
confertus, Dougl., N. Amer.
diffusus, Dougl., N. Amer.
Hartwegii, Bth., Mexico. (P. gentianoides, Ldl.)

Pentstemon—*cont.*
- lævigatus, Soland., N. Amer.
- — var. Digitalis, Gray. (P. Digitalis, Nutt.)
- Lemmoni, Gray, Calif.
- ovatus, Dougl., N. Amer.
- pubescens, Soland., N. Amer.
- — var. cærulescens, Hort.
- Rattani, Gray, N. Amer.
- strictus, Bth., N. Amer.

Ramondia pyrenaica, Rich., Pyrenees.

Romanzoffia sitchensis, Chm.

Schistanthe peduncularis, Kunze, S. Afr.

Scrophularia
- aquatica, L., Eur.
- Ehrhartii, Stev., Caucas.
- lateriflora, Traut., Caucas.
- nodosa, L., Eur.
- — var. serrulata, Hort.
- pauciflora, Bth., Sikkim, 12,000 ft.
- Scorodonia, L., Eur.
- vernalis, L., Eur.

Verbascum
- Lychnitis, L., Eur.
- macrostachyum, Griseb., Olympus.
- — var. olympicum, (Boiss.)
- phœniceum, L., Eur. Siber.
- — var. ferrugineum, (Mill.)
- phlomoides, L., Eur., etc.
- pyramidatum, Bbrst., Caucas.

Verbascum
- rubiginosum, W. et K., Hungary (cupreum, Sims.)
- Thapsus, L., Eur.
- — var. turkestanicum, Regel.

Veronica
- anomala, Armstr., N. Zeal.
- arvensis, L., Eur.

Veronica—*cont.*
- austriaca, L., C. et S. Eur.
- — var. pinnatifida, Pohl.
- Beccabunga, L., Eur.
- bellidioides, L., Eur.
- Buxbaumii, Ten., S. Eur., etc.
- caucasica, Bbrst., Caucas.
- Chamædrys, L., Eur.
- corymbosa, Hort., Loud.
- Dabneyi, Hochst., S. Eur.
- exaltata, Maud., Siberia.
- fruticulosa, L., Alps.
- gentianoides, Vahl, Taur., etc.
- incana, L., S. Eur., etc.
- incisa, Ait., Siberia.
- ligustrifolia, Cunn., N. Zeal.
- longifolia, L., C. et S. Eur.
- — var. alba, Hort.
- — var. mollis, Hort.
- — var. rosea, Hort.
- maritima, L., N. Eur.
- — var. variegata, Hort.
- officinalis, L., Eur., Amer.
- repens, DC., Eur.
- saxatilis, L., Eur.
- — var. Grievei, Hort.
- serpyllifolia, L., Eur.
- — var. humifusa, (Dicks.)
- spicata, L., Eur., etc.
- — var. hybrida, (L.)
- — var. ramosissima, Hort.
- Teucrium, L., Eur.
- — var. latifolia, (L.)
- — var. satureæfolia, Hort.
- virginica, L., N. Amer.
- — var. japonica, (Steud.)

Wulfenia carinthiaca, Jacq., Carinth.

Zaluzianskya
- capensis, Walp., Cape. (Nycterinia capensis, Bth.)
- selaginoides, Walp., Cape.

OROBANCHACEÆ.

Orobanche ramosa, L., Eur.

PEDALINEÆ.

Martynia
- Craniolaria, Sw., Ind., S. Amer.

Martynia—*cont.*
- fragrans, Ldl., N. Amer.
- proboscidea, Glox., N. Amer.

SELAGINEÆ.

- Dischisma arenarium, C. A. Mey., Cape.
- Globularia
  - trichosantha, Fisch. et Mey., Orient.
- Globularia—*cont.*
  - vulgaris, L., Eur.
  - — var. Wilkommii, (Nym.)
- Hebenstreitia
  - tenuifolia, Schrad., Cape.
  - — var. alba.

VERBENACEÆ.

- Phryma leptostachya, L., N. Amer.
- Verbena
  - bonariensis, L., S. Amer., etc.
  - caroliniana, Michx., N. Amer.
  - officinalis, L., Eur.
- Verbena—*cont.*
  - urticæfolia, L., Amer.
  - venosa, Gill. et Hk., Buenos Ayres.

ACANTHACEÆ.

Acanthus longifolius, Poir, S. Eur.

LABIATÆ.

- Ajuga Chamæpitys, Schreb., Eur., etc.
- Ballota nigra, L., Eur.
- Calamintha alpina, Bth., Alps.
  - Clinopodium, Bth., Eur.
  - grandiflora, Lam., S. Eur.
  - umbrosa, Reichb., S. Eur.
- Cedronella cana, Hook., Mexico.
- Cleonia lusitanica, L., S. Eur., N. Afr.
- Dracocephalum
  - nutans, L., Siberia.
  - peregrinum, L., Siberia.
  - Ruyschiana, L. Eur., Asia.
  - stramineum, Kar. et Kir., Russia.
- Elsholtzia cristata, Willd., S. Eur.
- Eremostachys laciniata, Buge, W. Asia.
- Horminium pyrenaicum, L., Pyren.
- Lallemantia
  - canescens, F. et M., Syria, etc.
  - iberica, F. et M., Orient.
  - peltata, Fisch. et Mey., Caucas.
  - Royleana, Bth., Turkest., etc.
- Lamium
  - album, L., Eur.
  - garganicum, L., S. Eur.
- Lavandula
  - Spica, L., S. Eur., etc.
  - — var. alba.
- Leonurus Cardiaca, L., Eur.
- Lophanthus
  - anisatus, Bth., N. Amer.
  - chinensis, Benth., China, etc.
- Lycopus
  - exaltatus, L. fil., Eur., etc.
  - europæus, L., Eur.
- Marrubium
  - candidissimum, L., S. Eur., etc.
  - peregrinum, L., Eur., etc.
  - — var. remotum, Hort.
  - vulgare, L., Eur.
- Melissa officinalis, L., Eur., etc.
- Mentha alopecuroides, Hall., Eur.
  - aquatica, L., Eur.
  - gentilis, L., Eur.
  - piperita, Huds., Eur.
  - pyramidalis, Ten., S. Eur.
  - Requienii, Bth., Corsica.
  - rotundifolia, L., Eur.
  - rubra, Sm., Eur.
  - sylvestris, L., Eur.
  - — var. umbrosa, Opiz.
  - viridis, L., Eur.
  - — var. crispa, Hook.

- Micromeria græca, Benth., Mediter.
- Monarda
  - didyma, L., N. Amer.
  - fistulosa, L., N. Amer.
  - — var. mollis, Benth.
- Monardella Pringlei, Gr., Calif.
- Nepeta
  - macrantha, Fisch., Siberia.
  - multibracteata, Desf., Atlas.
  - Mussini, Bbrst., Caucas.
  - Nepetella, L., S. Eur.
  - nuda, L., S. Eur.
- Origanum
  - Majorana, L., S. Eur. etc. (Majorana hortensis, Mœnch.)
  - vulgare, L., Eur.
  - var. album, Hort.
  - — hirtum, Hort.
- Phlomis
  - fruticosa, L., S. Eur.
  - Russeliana, Lagas., Orient.
  - tuberosa, L., Caucas., Siber.
  - umbrosa, Turcz., Siberia.
- Prunella
  - grandiflora, L., Eur., Cauc.
  - — var. rubra, Hort.
  - — var. officinalis, Crantz.
  - — var. laciniata, (L.)
  - vulgaris, L., Eur. (Brunella vulgaris, L.)
  - — var. laciniata, (L.)
- Physostegia
  - virginiana, Bth., N. Amer.
  - — var. speciosa, Gray. (P. imbricata, Hook.)
- Salvia
  - argentea, L., Mediter.
  - Candelabrum, Boiss., Spain.
  - clandestina, L., Greece, etc.
  - coccinea, L., Mexico. (S. pseudococcinea, Jacq.)
  - Columbariæ, Benth., Calif.
  - glutinosa, L., Eur.
  - hians, Royle., India.
  - hispanica, L., S. Eur.
  - Horminum, L., S. Eur.
  - interrupta, Schousb., Marocco.
  - lavandulæfolia, Vahl, S. Eur.
  - nilotica, Vahl, Egypt.
  - nubia, Ait., Abyssinia.
  - officinalis, L., S. Eur.
  - — var. alba, Hort.
  - pendula, Vahl, Eur.
- Salvia—*cont.*
  - pratensis, L., Eur.
  - — var. alba, Hort.
  - — var. rosea, Hort.
  - Regeliana, Trautv., Siberia.
  - Sclarea, L., S. Eur.
  - — var. bracteata, Hort.
  - sylvestris, L., S. Eur.
  - — var. alba, Hort.
  - tiliæfolia, Vahl, Mexico.
  - triangularis, Thunb., Cape.
  - Verbenaca, L., Eur.
  - verticillata, L., Eur.
  - virgata, Ait., Armenia.
  - viscosa, Jacq., S. Eur.
- Satureja
  - hortensis, L., Taur., Caucas.
  - montana, L., S. Eur.
- Scutellaria
  - alpina, L., Eur., etc.
  - galericulata, L., Eur.
  - peregrina, L., Tauria.
- Sideritis
  - scordioides, L., Eur.
  - — var. elongata, Hort.
- Stachys
  - alpina, L., Caucas., etc.
  - coccinea, Jacq., Mexico.
  - grandiflora, Bth., Caucas., etc. (Betonica grandiflora, L.)
  - Betonica, Benth., Eur. (B. officinalis, L.)
  - — var. alba, Hort.
  - longifolia, Benth., Caucas. (B. orientalis, L.)
  - paniculata, Bth., As. Minor.
  - setifera, Mey., Caucas.
  - sylvatica, L., Eur.
- Teucrium
  - canadense, L., N. Amer.
  - Chamædrys, L., Eur.
  - discolor, Royle., Himal.
  - multiflorum, L., Spain.
  - pyrenaicum, L., Pyrenees.
  - Scorodonia, L., Eur.
  - — var. crispun.
  - — var. variegatum.
- Thymus
  - carnosus, Boiss., Spain.
  - lanceolatus, Desf., Greece.
  - Mastichina, L., Spain, etc.
  - Serpyllum, Fries., Eur.
  - — var. albus, Hort.
  - — var. lanuginosus, (Schkr.)

PLANTAGINEÆ.

- Plantago
  - arenaria, L., Eur.
  - Coronopus, L., Eur.
  - Cynops, L., S. Eur.
  - fuscescens, Jord., S. Eur.
  - Ispaghula, Roxb., India.
  - lanceolata, L., Eur.
  - — var. irrigua, (Fisch.)
  - major, L., Eur.
- Plantago—*cont.*
  - — var. asiatica.
  - — var. intermedia, (Gilib.)
  - maritima, L., Eur.
  - maxima, Ait., Siberia.
  - media, L., Eur.
  - — var. rosæflora, Hort.
  - stricta, Schousb., Spain, N. Afr.

NYCTAGINEÆ.

- Abronia
  - latifolia, Esch., Calif. (A. arenaria, Hook.)
  - umbellata, Lam., Calif.
- Mirabilis multiflora, Gray, Amer.
- Oxybaphus nyctagineus, Sw., N. Amer.

ILLECEBRACEÆ.

- Herniaria
  - glabra, L., Eur., etc.
  - hirsuta, L., Eur.
- Paronychia
  - capitata, Lam., S. Eur.
  - dichotoma, Nutt., N. Amer.
- Paronychia—*cont.*
  - herniarioides, Nutt., N. Amer.
- Scleranthus
  - annuus, L., Eur.
  - perennis, L., Eur.
- Telephium Imperati, L., S. Eur.

AMARANTACEÆ.

- Amaranthus
  - chlorostachys, Willd., India.
  - hypochondriacus, L., Amer. etc.
  - — var. caudatus, (L.)
  - — var. speciosus, (Don.)
  - lividus, L., N. Amer., etc.
- Amaranthus—*cont.*
  - paniculatus, L., India, etc.
  - polygamus, L., Ind.
  - retroflexus, L., Amer., etc.
- Albersia caudata, Jacq., Orient. (Euxolus caudatus, Moq.)

CHENOPODIACEÆ.

- Acroglochin chenopodioides, Schrad., W. Himal.
- Atriplex
  - Halimus, L., Mediter.
  - hortensis, L., N. Asia.
  - — var. rubra, Hort.
  - laciniata, L. Eur., etc.
  - ruberrima, Hort.
  - sibirica, L., Siberia, (Obione sibirica, Fisch.)
  - tatarica, L., Eur. (A. oblongifolia, W. et K.)
- Beta
  - maritima, L., Eur.
  - orientalis, Heyne, India, etc. (B. benghalensis, Roxb.)
  - trigyna, W. et K., E. Eur.
  - vulgaris, L., Eur., Afr., etc.
- Chenopodium
  - album, L., Eur.
  - Bonus-Henricus, L., Eur.
  - capitatum, S. Wats., Eur. (Blitum capitatum, L.)
  - fœtidum, Schrad., Eur.

- Chenopodium—*cont.*
    - micranthum, Trautv. (Berlin, B.G.)
    - opulifolium, Schrad., Eur.
    - polyspermum, L., Eur.
    - Quinoa, L., S. Amer., etc.
    - Blitum virgatum, L., S. Eur.
    - Vulvaria, L., Eur.
- Corispermum hyssopifolium, L., S. Eur.
- Eurotia ceratoides, C. A. Mey., W. Himal.
- Hablitzia tamnoides, Bbrst., Caucas.
- Spinacia oleracea, L., Cult.

PHYTOLACCACEÆ.

- Phytolacca acinosa, Roxb., India.
- Phytolacca decandra L., N. Amer

POLYGONACEÆ.

- Oxyria elatior, R. Br., Nepal.
- Fagopyrum tataricum, Gaertn., Ind.
- Polygonum
    - affine, Don, Himal. (P. Brunonis, Wall.)
    - Bistorta, L., Eur.
    - capitatum, Don, Nepal.
    - Convolvulus, L., Eur.
    - cuspidatum, S. et Z., Japan.
    - — compactum, Hort.
    - cymosum, Desf., Eur.
    - divaricatum, L., Siber.
    - molle, Don, Himal.
    - multiflorum, Thunb., China, etc.
    - orientale, L., Orient.
    - viviparum, L., Eur.
    - Weyrichii, F. Schm., Sachal. Isl.
- Rheum
    - Emodi, Wall., Himal.
    - Moorcroftianum, Willd., Ind.
- Rheum—*cont.*
    - officinale, Baill., Thibet.
    - palmatum, L., Ind., etc.
    - — var. tanghuticum.
    - Rhaponticum, L., Siber.
    - Ribes, L., Syria, Persia.
    - — var. rugosum, Hort.
    - spiciforme, Royle, India.
    - undulatum, L., Siberia, etc.
- Rumex
    - abyssinicus, Jacq., Abyss.
    - Acetosa, L., Eur.
    - alpinus, L., Eur.
    - Brownianus, Campd., Austral.
    - bucephalophorus, L., Mediter.
    - Hydrolapathum, Huds., Eur.
    - nebroides, Campd., S. Eur.
    - nepalensis, Spr., Himal.
    - obtusifolius, L., Eur.
    - — var. sylvestris, (Wallr.)
    - Patientia, L., S. Eur.
    - salicifolius, Weinm., N. Amer.
    - vesicarius, L., N. Afr.

EUPHORBIACEÆ.

- Euphorbia
    - Characias, L., S. Eur.
    - falcata, L., S. Eur., etc.
    - heterophylla, L., Ind., etc.
    - — var.
    - Lagascæ, Spr., Spain.
    - Lathyris, L., Eur.
    - medicaginea, Boiss., Spain.
    - Myrsinites, L., Eur.
    - palustris, L., Eur.
- Euphorbia—*cont.*
    - Peplus, L., Eur.
    - platyphylla, L., Eur., etc.
    - — var. verrucosa, (L.)
    - Schimperiana, Hochst., (St. Peter.)
    - terracina, L., Italy, etc.
    - virgata, W. et K., Hungary.
- Mercurialis annua, L., Eur.

URTICACEÆ.

Debregeasia
    velutina, Gaud. (Conocephalus niveus, Wight.), India.
Humulus japonicus, S. et Z., Japan.
Forskohlea tenacissima, L., Egypt.
Parietaria
    officinalis, L., Eur.
Parietaria—*cont.*
    lusitanica, L., S. Eur.
Urtica
    dioica, L., Eur.
    elevata Banks, Madeira.
    — var. grandidentata.
    pilulifera, L., Eur.
    — var. balearica, (L.)

IRIDEÆ.

Anomatheca cruenta, Ldl., Natal.
Crocus
    aureus, Sm., S. Eur.
    asturicus, Herb., Spain.
    Balansæ, Gay, As. Minor.
    biflorus, Mill., Tuscany, etc.
    cancellatus, Herb., Ionian Isl.
    — var. cilicicus, Kotschy.
    Clusii, Gay, Portugal.
    corsicus, Maw, Corsica.
    etruscus, Parl., Tuscany.
    Imperati, Ten., Neapol. district.
    iridiflorus, Heuffl., Transyl.
    sativus, L., Cult.
    — var. Elwesii.
    suaveolens, Bert., C. Italy.
    Tommasinianus, Herb., Dalmat.
    vernus, All., C. Eur.
    versicolor, Bert., Marit. Alps.
    zonatus, Gay, Cilicia.
Iris
    biflora, L., Spain, etc.
    Chamæiris, Bert., S. Eur.
    — var. lutescens.
    — olbiensis.
    Fieberi, Seidl., Spain.
    fœtidissima, L., Eur. etc.
    cuprea, Pursh, N. Amer. (I. fulva, Ker.)
    graminea, L., Eur.
    Guldenstædtiana, Lepech., Siber.
    longipetala, Herb., Calif.
Iris—*cont.*
    mellita, Jka., Thrace.
    Monnieri, DC., Crete.
    ochroleuca, L., Siber. (I. gigantea, Carrière.)
    Pseudacorus, L., Eur., etc.
    — var. acoriformis, (Bor.)
    — var. Bastardi, (Bor.)
    setosa, Pallas, Siberia.
    — var. atropurpurea.
    sibirica, L., Eur., Siberia.
    — var. acuta, (Willd.)
    sibirica var. alba, Hort.
    spuria, L., C. Eur., etc.
    — var. desertorum, (Ker.)
    — var. notha, (Bbrst.)
    squalens, L., Eur.
    Statellæ, Todaro, Eur.
    Tolmieana, Herb., N. Amer.
    Xiphium, L., Spain, etc. (Xiphion vulgare, Mill.)
    — varieties.
    xiphioides, Ehr., Pyrenees (X. latifolium, Mill.)
    versicolor, L., N. Amer.
    virginica, L., N. Amer.
Orthrosanthus multiflorus, Sweet, Austral.
Sisyrinchium Bermudiana, L., Bermuda.
    californicum, Ait. f., Calif.
    chilense, Hook., Chili.
    luteum, Hort.
    striatum, Sm., Chili.

AMARYLLIDACEÆ.

- Alstræmeria
  - aurantiaca, Don, Chili.
  - hæmantha, R. et P., Chili.
- Crinum
  - capense, Herb., Cape.
  - — var. riparium.
- Leucoium
  - æstivum, L., Eur., etc.
  - vernum, L., Eur., etc.
- Narcissus
  - Grællsi.
  - triandrus, L., Pyrenees.

DIOSCOREÆ.

Tamus communis, L., Eur.

LILIACEÆ.

- Allium
  - Ampeloprasum, L., Eur.
  - angulosum, L., Siberia.
  - — var. acutangulum, (Schrad.)
  - atropurpureum, W. et K., Hungary.
  - attenuifolium, Kellogg, N. Amer.
  - — var. roseum.
  - cæruleum, Herb., Russia.
  - carinatum, L., Eur.
  - declinatum, Reichb., Siberia.
  - fistulosum, L., Siberia.
  - giganteum, Regel., Siber.
  - globosum, Bbrst., Caucas.
  - — var. albidum.
  - karataviense, Regel, Turkestan.
  - hymenorrhizum, Ledeb., Siberia.
  - — var. tenuifolium, Regel.
  - Ledebourianum, R. et S., Siberia.
  - neapolitanum, Cyril., Italy, etc.
  - nigrum., L., S. Eur., etc.
  - — var. multibulbosum, Jacq,
  - nutans, L., Siberia.
  - odorum, L., Siberia.
  - paradoxum, Don, Siberia.
  - polyphyllum, Kar. et Kir., Siberia.
  - Porrum, L., S. Eur.
  - pulchellum, Don, S. Eur., etc.
  - — var. flavum, S. Eur.
- Allium—*cont.*
  - roseum, L., S. Eur.
  - — var. carneum, Reichb
  - Schœnoprasum, L., Eur.
  - — var. sibiricum, (L.)
  - Scordoprasum, L., Eur.
  - senescens, L., Eur., Siber.
  - sphærocephalum, L., Eur.
  - — var. Deseglesei, (Bor.)
  - Stellerianum, Willd., Siberia.
  - subhirsutum, L., S. Eur., etc.
  - Suworowii, Regel., Turkest.
  - tricoccum, Ait., N. Amer.
  - urceolatum, Regel, Turkey.
  - ursinum, L., Eur.
  - vernale, Tineo, Sicily.
  - Victorialis, L., Eur.,Siber.,etc.
- Anthericum
  - Liliago, L., S. Eur., N. Afr.
  - — var. Algeriense, (Boiss.)
  - — var. Dorseti, Hort.
  - ramosum L., Eur.
- Asparagus officinalis, L., Eur.
- Asphodeline lutea, Reichb., S. Eur.
- Asphodelus
  - albus, Willd., Eur.
  - — var. æstivus, (Brot.)
  - ramosus, L., S. Eur.
- Brodiæa
  - congesta, Sm., Calif.
  - grandiflora, Sm., Calif.
  - lactea, S. Wats., Calif.
  - peduncularis, Wats., Calif.
  - uniflora, Bth., Buenos Ayres, (Triteleia uniflora, Ldl.)

- Bulbine annua, Willd., Cape.
- Bulbocodium vernum, L., Eur.
- Camassia
  - esculenta, Ldl., N. Amer.
  - Leicthlinii, Wats., N. Amer.
- Chlorogalum pomeridianum, Kunth, Calif.
- Colchicum speciosum, Stev., Caucas.
- Convallaria majalis, L., Eur., Amer.
- Eremurus altaicus, Stev., Caucas.
  - Bungei, Baker, Orient.
- Fritillaria
  - imperialis, L., Eur.
  - — var. inodora.
  - Meleagris, L., Eur.
  - pontica, Wahl., Bithynia.
  - ruthenica, Wickst., Siber.
  - tenella, Bbrst., Caucas.
- Funkia
  - lancifolia, Spr., Japan.
  - — var. alba, Hort.
  - — var. albo-marginata, Hort.
  - ovata, Spr., Japan.
  - Sieboldiana, Lodd., Japan.
  - subcordata, Spr., Japan. (F. grandiflora.)
- Galtonia candicans, Dcne., Natal. (Hyacinthus candicans, Bkr.)
- Glyphosperma Palmeri, S. Wats., Mexico.
- Hemerocallis
  - Dumortieri, Morren, Japan (H. Sieboldii, Hort.)
  - flava, L., S. Eur.
  - fulva, L., S. Eur., etc.
  - — var. Kwanso. Regel.
- Hyacinthus
  - amethystinus, L., Spain.
  - dubius, Guss., S. Eur.
  - romanus, L., S. Eur., etc. (Bellevalia romana, Reichb.)
- Kniphofia
  - aloides, Mœnch, Cape.
  - corallina, Hort. Leichtlin.
- Merendera Bulbocodium, Ram., S. Eur.
- Muscari
  - armeniacum, Baker, Medit.
  - commutatum, Guss., S.Eur.
  - Heldreichii, Boiss., Greece.
  - neglectum, Baker, S. Eur.
  - racemosum, Mill., Eur.
  - Szovitsianum, Regel, Siber.
- Narthecium ossifragum, Hud., Eur.
- Nothoscordum
  - aureum, Hk. fil., Calif.
  - fragrans, Kunth, Amer., Africa, Asia.
- Ornithogalum
  - arcuatum, Stev., Caucas.
  - exscapum, Ten., S. Eur.
  - fimbriatum, Willd., Orient.
  - latifolium, L., Egypt, etc.
  - narbonense, L., S. Eur.
  - orthophyllum, Ten., S. Eur.
  - tenuifolium, Guss., Sicily.
  - umbellatum, L., Eur., N. Afr.
- Polygonatum
  - anceps, Mœnch, Eur., etc.
  - — var. striatum, Hort.
  - biflorum, Ell., N. Amer. (P. pubescens, Pursh.)
  - giganteum, Dietr., N. Amer. (P. latifolium, Desf.)
  - multiflorum, All., N. T. Zone
  - — var. fl. pl.
  - verticillatum, All., Eur.
- Puschkinia scilloides, Adams, Caucas., etc.
- Scilla
  - amœna, L., S. Eur., etc.
  - campanulata, Ait., Spain, etc. (S. hispanica, Mill.)
  - — var. alba, Hort.
  - italica, L., Italy, etc.
  - lingulata, Desf., N. Afr.
  - nutans, Sm., Eur. (S. non-scripta, Link.)
  - — var. alba.
  - — var. cernua, (Hoffm.)
  - pratensis, W. et K., Croatia.
  - verna, Huds., W. Eur.
- Smilacina
  - stellata, Desf., N. Amer.
  - racemosa, Desf., N. Amer. (Tovaria racemosa, Neck.)
- Tulipa
  - biflora, L., Caucas.
  - Greigii, Regel, Siberia.
- Veratrum
  - nigrum, L., Eur.
  - viride, Ait., N. Amer., etc.
- Wachendorfia thyrsiflora L., Cape.
- Zygadenus elegans, Pursh, N. Amer. (Z. commutatus, Schult. fil., Z. canadensis, Hort., Z. chloranthus, Richards, Anticlea glauca, Kunth.)

COMMELINACEÆ.

Commelina
  cœlestis, Willd.
  scapiflora, Roxb., E. Ind.
Tradescantia
  erecta, Jacq., Mexico.

Tradescantia—*cont.*
  virginica, L., N. Amer.
  — var. latifolia, Hort.
  — var. pilosa, (Lehm.)
  — var. splendens, Hort.

JUNCACEÆ.

Juncus
  acutiflorus, Ehrh., Eur.
  balticus, Willd., Eur.
  compressus, Jacq., Eur.
  conglomeratus, L., Eur. (J. communis, Meyer.)
  filiformis, L., Eur.
  glaucus, Ehrh., Eur.
  lamprocarpus, Ehrh., Eur.

Juncus—*cont.*
  obtusiflorus, Ehrh., Eur.
  platycaulis, H. B.K.S., Amer.
  tenuis, Willd., Eur.
  trifidus, L., Eur.
Luzula
  campestris, DC., Eur.
  nivea, Desv., Alps, etc.

TYPHACEÆ.

Sparganium
  ramosum, Curtis, Eur.
  simplex, Huds., Eur.

Typha
  angustifolia, L., Eur.
  latifolia, L., Eur.

AROIDEÆ.

Arum orientale, Bbrst., caucas, etc.

ALISMACEÆ.

Alisma Plantago, L., Eur.

Butomus umbellatus, L., Eur.

NAIADACEÆ.

Triglochin palustre, L., Eur.

Triglochin palustre, var. Barrelieri, (Loisl.)

CYPERACEÆ.

Carex
  acuta, L., Eur.
  adusta, Boott, N. Amer.
  ampullacea, Good., Eur.
  arenaria, L., Eur.
  axillaris, Good., Eur.

Carex—*cont.*
  binervis, Sm., Eur.
  crinita, Lam., N. Amer.
  depauperata, Good., Eur.
  distans, L., Eur.
  disticha, Huds., Eur.

Carex—*cont.*
divisa, Huds., Eur.
divulsa, Good., Eur.
Ecklonei, Nees., Cape.
flava, L., Eur., etc.
— var. Oederi, (Ehrh.)
glauca, Murr., Eur.
Grayii, Carey, N. Amer.
hirta, L., Eur.
hordeiformis, Whlbrg., Eur. Cauc. (hordeistichos, Vill.)
lagopodioides, Schk., N. Amer.
Linkii, Willd., Mediter.
Morrowii, Boott, Japan.
ovalis, Good., Eur.
paniculata, L., Eur.
pendula, Huds., Eur. (C. maxima, Scop.)
punctata, Gaud., Eur.
remota, L., Eur.
riparia, Curtis, Eur.
straminea, Schk., N. Amer. (C. fœnea, Mhlbrg.)
strigosa, Huds., Eur.

Carex—*cont.*
sylvatica, Huds., Eur.
tenella, Schk., Amer., etc.
vaginata, Tausch, Eur.
vulgaris, Fries, N. Amer., etc.
vulpina, L., Eur.
Cladium germanicum, Schrad., Eur., etc. (C. Mariscus, R. Br.)
Cyperus vegetus, Willd., N. Amer.
Eleocharis palustris, R. Br., Eur.
Eriophorum angustifolium, Roth. Eur.
Schœnus nigricans, L., Eur.
Scirpus
atrovirens, Muhl., N. Amer.
Caricis, Retz., Eur. (Blysmus compressus, Panz.)
setaceus, L., Eur.
sylvaticus, L., Eur.
Tabernæmontani, Gmel., Eur.
— var. zebrinus, Nicholson.
triqueter, L., Eur.

GRAMINEÆ.

Ægopogon pusillus, Beauv., Mexico.
Agropyrum caninum, Beauv., Eur. (Triticum caninum, Screb.)
muricatum, Schult., Eur. (T. muricatum, Link.)
junceum, Beauv., Eur., etc. (T. junceum, L.)
repens, Beauv., Eur., etc. (T. repens, L.)
— var. aristatum.
Agrostis
alba, L., Eur.
— var. stolonifera, (L.)
vulgaris, With., Eur.
— var. foliis variegatis.
— var. nigra, (With.)
Aira caryophyllea, L., Eur.
Alopecurus
geniculatus, L., Eur.
nigricans, Hornem., Eur.
pratensis, L., Eur.
— var. fol. variegatis.
Andropogon
furcatus, Mhlbrg., N. Amer.
scoparius, Michx., N. Amer.

Anthoxanthum odoratum, L., Eur.
Puelii, Lecoq et Lamotte, Eur.
Apera Spica-venti, Beauv., Eur. (Agrostis Spica-venti, L.)
Arundo conspicua Forst., New Zeal. (Calamagrostis conspicua, Gmel.)
Arrhenatherum avenacum, Beauv., Eur.
Avellinia Michelii, Parl., Eur.
Avena sativa, L., S. Eur.
Brachypodium,
distachyum, R. et S., Medit.
gracile, Beauv., Eur. Siber.
pinnatum, Beauv., Eur.
Briza
media, L., Eur.
minor, L., Eur.
Bromus arvensis, L., Eur.
Biebersteinii, R. et S., Caucas.
breviaristatus, Thurb., N. Amer.

- Bromus—*cont.*
    - ciliatus, L., N., Amer. (B. canadensis, Michx., B. purgans L.)
    - erectus, Huds., Eur., etc.
    - inermis, L., Eur., etc.
    - macrostachys, Desf., Spain, etc.
    - maximus, Desf., Eur.
    - — var. Gussonii, (Parl.)
    - mollis, L., Eur., etc.
    - — var. glabrescens, Coss.
    - secalinus, L., Eur.
    - sterilis, L., Eur.
- Calamagrostis
    - epigeios, Roth, Eur.
    - lanceolata, Roth, Eur.
    - varia, Trin., Eur., etc.
- Catabrosa aquatica, Beauv., Eur.
- Ceratochloa unioloides, DC., S. Eur. (Bromus unioloides, H.B.)
- Chloris elegans, H.B.K., Mexico.
- Cynodon Dactylon, L., Cosmop.
- Cynosurus cristatus, L., Eur.
- Dactylis glomerata, L., Eur., etc.
- Deschampsia
    - cæspitosa, Beauv., Eur. (Aira cæspitosa, L.)
    - — var. vivipara.
    - flexuosa, Trin., Eur. (Aira flexuosa L.)
- Eleusine
    - coracana, Pers., S. Amer., etc.
    - — var. stricta.
- Elymus
    - arenarius, L., Eur., etc.
    - canadensis, L., N. Amer.
    - — var. glaucifolius, Gray.
    - condensatus, Presl, N. Amer.
    - giganteus, Vahl, Siber., etc.
    - mollis, Trin., N. Amer.
    - virginicus, L., N. Amer.
- Erianthus strictus, Baldw., N. Amer.
- Festuca
    - arundinacea, Schreb., Eur. (decolorans, Mert.)
    - ciliata, Danth., S. Eur. (Vulpia ciliata, Link.)
    - duriuscula, L., Eur., Amer.
    - elatior, L., Eur., etc.
    - — var. pratensis, Auct.
    - Halleri, All., S. Eur.
    - heterophylla, Haenke, Eur.
    - incrassata, Salzm., S. Eur. (Vulpia incrassata, Trin.)
- Festuca—*cont.*
    - Myurus, L., Eur. (V. Myurus, Gmel.)
    - ovina, L., Eur.
    - rigida, Kunth, Eur. (Sclerochloa rigida, Panzer.)
    - sciuroides, Roth, Eur. (V. bromoides, Link, F. bromoides, L.)
- Glyceria
    - elongata, Trin., N. Amer.
    - maritima, Wahl., Eur.
- Hierochloe borealis, Roem. et Schult., Eur.
- Holcus lanatus, L., Eur.
- Hordeum
    - bulbosum, L., S. Eur.
    - jubatum, L., N. Amer.
    - murinum, L., Eur.
    - pratense, Huds., Eur.
- Kœleria cristata, Pers., Eur.
- Lolium
    - perenne, L., Eur.
    - — var. italicum, (Braun.)
    - temulentum, L., Eur.
- Melica
    - altissima, L., S. Eur., Cauc., etc.
    - ciliata, L., Eur., etc.
    - — var. Cupani, (Guss.)
    - — var. Magnolii, (G. et G.)
    - penicillaris, Hort.
    - nutans, L., Eur.
    - uniflora, Retz., Eur.
- Molinia
    - cærulea, Mœnch, Eur.
    - — var. variegata.
- Muhlenbergia Willdenovii, Trin., N. Amer.
- Nardus stricta, L., Eur.
- Panicum
    - capillare, L., N. Amer.
    - colonum, L., Ind., etc.
    - ciliare, Retz., Eur., etc. (Digitaria ciliaris, Koch.)
    - Crus-galli, L., S. Eur.
    - decompositum, R. Br., C. Australia.
    - effusum, R. Br., Austral.
    - jumentorum, Pers., S. Amer.
    - — var. bulbosum.
    - maximum, Jacq., S. Amer.
    - Wightii, Nees., Ind. Or.
- Phalaris
    - arundinacea, L., Eur., etc. (Digraphis arundinacea, Trin.)
    - — var. fol. variegatis.

Phalaris—*cont.*
  canariensis, L., S. Eur., etc.
  cærulescens, Desf., S. Eur., etc.
  paradoxa, L., S. Eur.
Phænosperma globosa, Munro, China.
Phleum
  pratense, L., Eur.
  — var. nodosum, (L.)
Poa
  alpina, L., Eur.
  — var. badensis, (Haenke).
  annua, L., Eur., etc.
  compressa, L., Eur.
  glauca, Sm., Eur.
  sudetica, Haenke, Eur.
  trivialis, L., Eur.
Setaria
  glauca, Beauv., Eur.
  macrochæta, Link, Eur., Asia, etc.
Schismus marginatus, Beauv., S. Eur.
Secale
  cereale, L., As. Minor.
  montanum, Guss., Sicily.
Sorghum
  cernuum, Willd., Ind.
  halepense, L., S. Eur., etc.
  saccharatum, Moench, Ind., etc.
  vulgare, Pers., Ind., etc.
  — var. bicolor, Willd.
Stipa
  Aristella, L., S. Eur., etc.
  barbata, Desf., N. Afr.
  Calamagrostis, Whlbrg., S. Eur. (Lasiagrostis Calamagrostis, Link.)
  fertilis, Desf., S. Eur.
  pennata, L., Eur., Siber.
Triticum monococcum, L., Eur.
Trisetum flavescens, Beauv., Eur.
Zea
  Mays, L., S. Eur.
  — var. rubra.

LONDON: Printed by EYRE and SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.
[16.—575.—1/88.]

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 15.] MARCH. [1888.

XXXII.—FORSTERONIA RUBBER.

(*Forsteronia gracilis*, Benth.)

The flora of British Guiana is in course of being carefully and intelligently investigated by Mr. Jenman, the Government Botanist and Superintendent of the Botanic Garden at Georgetown. The critical determination of the plants is carried on at Kew, where typical specimens are added to the collections of Guiana plants already existing in this establishment. Among the plants for which we are indebted to the zeal and sagacity of Mr. Jenman there are many of economic value. Recently we received from him dried botanical specimens and sample of rubber from a plant locally called Macwarrieballi, not hitherto known to yield caoutchouc. A botanical examination of the specimen by Professor Oliver proved that this plant was a species of *Forsteronia* (*F. gracilis*, Benth.), a genus of *Apocynaceæ*. This family is extremely rich in india-rubber plants, and comprises all those which yield rubber of African and Malayan origin. The plant under notice appears from Mr. Jenman's account to be "a large twining plant, the stem of which " trails on the floor of the forest, snake-like, and the head spreads over " the tops of the highest trees above." He continues: "the flowers " are not quite out. I send also a sample of the rubber, which, if you

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HODGES, FIGGIS, & Co., 104, GRAFTON STREET, DUBLIN.

1888.

Price Twopence.

"could obtain a report on, I should be greatly obliged. It is discoloured from the creek water in which it was washed, the only kind of water that was there obtainable. The fresh milk seems to be rich beyond any I have before found in caoutchouc. The only defect I experienced is that it dries slowly, remaining sticky for some time."

Through the kindness of Mr. S. W. Silver, F.L.S., to whose good offices in connection with the investigation of numerous samples of rubber this establishment is greatly indebted, we have been favoured by the India-rubber, Gutta-percha, and Telegraph Works Company, Limited, of Silvertown, with an interesting report, dated 20th January 1888, upon the properties of this new kind of rubber from British Guiana. We are informed that the substance possessed "so many valuable properties, that it would be well to ascertain whether a larger quantity could be placed in our hands for further experimenting. The present quantity is far too small to enable any one to say whether it would be practicable to extract or utilise the large quantity of caoutchouc which it contains, so as to give this substance a position of commercial importance.

"We note the remark as to its being 'discoloured by being washed 'in peaty water'; this treatment has in no way interfered with our being able to report upon it. One side of it is coated with a brownish substance of a resinous character, and is evidently produced either by oxidation of the resin itself, contained in this substance, or from some other cause.

"The substance, as it is, cannot be worked at all with the present india-rubber appliances; this is due to its adhesiveness. This introduces the serious difficulty of removing water from it by any ordinary process of drying, which is *essential* with india-rubber.

"On removal of the resin, the caoutchouc is recovered in a soft, sticky condition, quite unfit for manipulating as india-rubber.

"When a substance of such promise is sent for examination, it is not only important that a larger supply should be available for the purposes of a preliminary examination, but for subsequent experiments; frequently an application has been found for a vegetable product by accident, from being able to fall back upon it, as it were, as opportunity presents itself."

So far, there appear good grounds for believing that if the plant from which the rubber was extracted exists in any quantity in the interior of Demerara, the collection of the rubber would be a very promising commercial undertaking.

In connection with this subject, it may be useful to draw attention to the fact that another species of *Forsteronia* (*F. floribunda*), called in Jamaica milk-wythe or green-wythe, has long been known to yield caoutchouc. In the Report of the Director of the Botanical Department, Jamaica, 1883, p. 17, it is stated that, "an indigenous plant, known as the 'green withe' of Jamaica, yields excellent rubber, a specimen of which was sent to me by the Rev. E. Bassett Key.

"This plant, probably a species of Echites [*Forsteronia*], is found only in the interior woods of Manchester and St. Elizabeth, and, so far, I have been unable to obtain specimens in flower or fruit."

In the Report for the year 1884, pp. 46–47, it is further stated that the "indigenous plant, known as the 'milk-withe,' found in the mountains of Manchester and St. Elizabeth's, yields an excellent rubber.

"A specimen of what I believe to be the same rubber was presented some years ago to the Museum of the Pharmaceutical

" Society of Great Britain by Mr. John Sawyers, of Derry, in the " parish of Manchester.

" The plant yielding this rubber has now (thanks to further speci- " mens sent to me by Mr. Bassett Key) been determined at Kew as " *Forsteronia floribunda*," G. Don.

XXXIII.—PATCHOULI.

(*Pogostemon Patchouli* var. *suavis.*)

Patchouli is a well-known scent obtained by distillation from the leaves of a cultivated variety of *Pogostemon Patchouli*. It first became familiar in Europe as a characteristic odour associated with Indian shawls. The leaves are sometimes used in a powdered state for scenting drawers, after the manner of the old-fashioned lavender bag. The otto or essential oil is of a dark brown colour, with an odour said to be more powerful than any obtained from the vegetable kingdom. The chief supply of Patchouli appears to come from the Straits Settlements and islands in the Eastern Archipelago, including Java.

Fuller particulars respecting Patchouli and its uses may be obtained from the Art of Perfumery, by Piesse, p. 174, and Spon's Encyclopædia of Industrial Arts, Div. IV., p. 1425.

The present note brings together the information which has reached this establishment lately respecting the actual source of Patchouli and its present commercial value.

In Mr. Cantley's Report on the Forest Department of the Straits Settlements for 1886, he says:—" Plants of Patchouly have been in " demand for experimental planting, and a good number have been " supplied. Picked leaves are now selling at 17 dollars per picul. " The plants grow freely with but little care, and should figure among " colonial products. Plants raised from seed are reported to grow " well, but to have no scent, but retain it when produced from cuttings. " I have not been able to verify these statements, but it is well known " that plants do sometimes play tricks of this kind."

In September last the following letter was received from Mr. C. Curtis, Assistant Superintendent, Forest Department, at Penang:—

"Penang, 17th August, 1887.

" I have the honour to advise you of the despatch, per S.S. ' Khedive,' " of one small case, containing dried plants for determination, and " samples of Patchouli for an opinion as to their market value.

" The latter are from the Experimental Nursery, where one-twentieth " of an acre has just been harvested, and some valuable experience " gained as to cost of cultivation, loss of weight in course of prepara- " tion, &c., details of which will be supplied in due course.

" The samples numbered 1 and 2 consist of picked leaves, and stems " and leaves together, the system of drying having been the same in " both cases.

" Sample 3 is dried leaves of *Urena lobata*, L., var. *sinuata*, largely " used to adulterate Patchouli; and it would be interesting to know " whether it contains any useful property or is added entirely to " increase the bulk. This is not cultivated, but found growing wild " in considerable quantity in cocoa-nut gardens and waste places near " the coast. For mixing with Patchouli it fetches from three dollars " to four dollars per picul ($133\frac{1}{3}$ lbs.), dried as per sample.

"I trust you will not think me troublesome when I ask you to be "good enough to submit the three samples to a competent judge of "their market value, and by so doing you will be conferring a benefit "on agriculture, as we shall be enabled to form a definite opinion "whether extended cultivation will prove profitable or otherwise.

"Any information respecting the preparation, probable future "demand, &c., would also be of great assistance.

"C. CURTIS."

The specimens received from Mr. Curtis were forwarded to Messrs. Piesse and Lubin, of New Bond Street, who were good enough to report upon them, as follows:—

"2, New Bond Street,
"8th October 1887.

"The sample No. 1 is excellent. The commercial value we estimate "to be about 80*l.* or 100*l.* per ton. No. 2 is less valuable *pro rata* for "the weight of stalks, which have no odour, and yield no attar on "distillation. No. 3 you correctly describe as being used for the "adulteration of the genuine leaves. We always find it in the "Patchouli leaves we purchase for perfumery purposes. If it yielded "an odourous essential oil on distillation, that would possess some "commercial value. The sample appears to us, however, to have but "a very slight camphoraceous odour.

"We are expecting shortly the first consignment of Patchouli leaves "from Mr. J. C. Fillan, who is growing it experimentally in Dominica.

"The demand for both leaves and attar of Patchouli, though not "very great, is steady and continuous. The attar fetches about 2*s.* 6*d.* "to 3*s.* per oz. weight.

"PIESSE AND LUBIN."

Similar specimens were forwarded to Messrs. Burgoyne, Burbidges, Cyriax, and Farries, who obligingly sent the following report:—

"16, Coleman Street, 12th October 1887.

"I am in receipt of your favour of the 3rd ultimo, together with "samples of leaves. The sample 1, *Pogostemon Patchouli*, is good, "small, free from stalks, and worth about 1*s.* per lb. No. 2 is very "stalky but fair flavour, worth about 4*d.* to 5*d.* per lb. No. 3, "'Bupulut,' is not known on the market and is of no commercial "value. I doubt if it contains any useful property, and should think "it would only be added to increase the bulk of Patchouli.

"These valuations I have given you would apply to shipments of "about five tons; if a large parcel, say 20 tons, were suddenly put on "the market, values would probably decline. It is, therefore, advisable "to exercise caution in making shipments. At the present moment "there is a very fair demand for good leaves. Any further information "you require I shall be happy to give you.

"BURGOYNE, BURBIDGES, CYRIAX, AND FARRIES."

On the present position of the market, as regards Patchouli leaves, Mr. R. C. Treatt was good enough to supply us with the following information:—

"Mincing Lane, E.C.,
"20th October 1887.

"Referring to my letter of this date, I am glad to be able to give "you a little information of a business character *re* Patchouli.

"The supply is somewhat limited in this market, and the quality of "leaves arriving here not, as a rule, quite satisfactory. The quality "most sought after is the sample No. 1, which you sent to Messrs. Piesse "and Lubin, *i.e.*, a fairly long leaf without stalks. The presence of "many stalks in a bale of leaves reduces its value fully 25 per cent.

"There is ever a good demand for leaves, as the London market "supplies the Continent as well as England. Buyers would always "prefer to buy the oil itself, but, as a rule, distillers in the East "adulterate it. If a *genuine* oil could be shipped, it would fetch "3*s*., 3*s*. 6*d*., 3*s*. 9*d*. per oz. Packages, cases of 12 and 22 oz. bottles. "The leaves are shipped in bales, 200 lbs. each, and fetch, if good, 1*s*. "to 1*s*. 3*d*. per lb., less 2½ per cent. The present demand is *good;* 50 "to 100 bales would sell were they here and of good quality.

"Should the Government of the Straits Settlements decide to ship "the leaves or the oil, I should be glad to receive consignments and "sell them on the market for 3 per cent. commission, or to buy them "outright, subject to approval of quality.

"Should you think of any other information which I might, in my "business capacity, be able to give you, I shall be pleased to give you "same.

"R. C. TREATT."

The above information will, no doubt, prove acceptable to correspondents in tropical Colonies, and it will, at the same time, usefully serve to meet an inquiry which has reached this establishment respecting Patchouli from the Government of India.

In a letter dated Simla, 5th August 1887, the Revenue and Agricultural Department desired to be furnished with information "regarding "the growth of the Patchouli plant in Assam, especially with reference "to the following points: (*a*) is the plant grown to any extent in Assam "and the Khasia Hills, and is it the *Plectranthus Patchouli* or (the "true plant) *Pogostemon Patchouli?* and (*b*) can its cultivation be "generally extended; more particularly, can it be cultivated in Bengal"?

To this, the following reply was addressed to the India Office:—

"Royal Gardens, Kew, 30th January 1888.

"The true Patchouli plant is free from ambiguity, it is the *Pogostemon Patchouli* described and figured by Sir William Hooker in the "Kew Journal of Botany, vol. i., p. 328, t. 11, from cultivated "specimens. This stands in the Flora of British India (vol. 4, p. 634) "as *Pogostemon Patchouli*, var. *suavis*. My colleague, Prof. Oliver, "the keeper of the herbarium of the Royal Gardens, is of opinion that "it is doubtful whether this particular form, which is the economic "plant of commerce, is indigenous in any part of India. I agree with "him in this opinion, as also in thinking that it may ultimately prove "to have originated in China.

"It may be laid down then as certain that the true economic "Patchouli plant is accurately known, though at present of obscure "origin. It is equally certain that it is abundantly cultivated in the "Straits Settlements. The Patchouli of commerce is, as far as India "is concerned, an exotic production. I may remark, however, that "Dr. King, the Superintendent of the Royal Botanic Garden, Calcutta, "when recently in England, informed us that there is a plant known at "Calcutta as Patchouli, that it does not flower, but that, as far as his "memory served, it did agree with the true plant figured by Sir William "Hooker. Nothing of course can be more probable than that it has "been introduced into cultivation at Calcutta from the Straits.

"There is no evidence whatever in the Kew herbarium of the
" existence of any form of *Pogostemon Patchouli*, scented or scentless,
" in the Khasia or Assam region.

" There appears to be evidence, however, of the existence of a plant
" with a Patchouli odour, native to Khasia and Assam. What this
" plant may be is doubtful; but it is certainly not the Patchouli of
" commerce. It finds a place in the Flora of British India, vol. 4,
" p. 624, as a doubtful *Plectranthus* (*Plectranthus Patchouli*, Clarke).
" Whatever it may be, it is widely different from any form of *Pogostemon*
" *Patchouli*. But it is, of course, not denied that if it has the true
" odour it may have a commercial use in India. There is no inherent
" scientific improbability in widely different plants elaborating the same
" essential oil. That, however, is a point to be worked out upon the
" spot, upon which I can give no opinion.

" What may be regarded as feral states of *Pogostemon Patchouli*,
" probably usually scentless, are commonly indigenous in the Western
" Peninsula, from Bombay southwards. There may, however, be local
" scented forms which are cultivated, and, for aught I know, the true
" commercial Patchouli plant may be cultivated in Indian gardens in
" the Peninsula. All this can only be ascertained by inquiry. If dried
" specimens of plants used as Patchouli could be obtained from different
" parts of India, the matter could be very readily settled by botanical
" investigation at Kew.

" W. T. THISELTON DYER."

XXXIV.—WEST AFRICAN INDIGO PLANTS.

Judging by the number of specimens sent to Kew, and the inquiries made respecting them, it is evident that considerable activity exists on the West Coast of Africa in regard to plants of economic value. During the last three weeks, 10 specimens of so-called Indigo plants have been forwarded by different correspondents. Some of these have been nothing more than the ordinary Indigo plants *Indigofera tinctoria*, and *I. Anil*, which it is well known are plentifully distributed in West Africa. Others have consisted of leaves of the Yoruba Indigo, *Loncho carpus cyanescens*, Benth., which has been already investigated at Kew, but of which specimens of flowers and of fruit are still wanting to complete the material for identification.

In one case, fruits of *Randia malleifera*, Benth., have been sent. The inky sap of this fruit, locally called "Blippo," is used by the Niam-Niam and the Monbuttoo to dye themselves. The juice at first is described by our correspondent as colourless, but it is said to develop a deep blue colour in a day or two. The fruits of *Gardenia sp.* near *Gardenia Thurnbergii*, and the seeds of *Cremaspora africana* were also sent as yielding Indigo, but apparently under a mistaken idea that they were identical with the species of *Randia* above mentioned. A quantity of what appeared to be the corms of an aroid plant, disc-shaped and about half-an-inch in diameter, were recently received from Old Calabar, as "beans which make a blue dye of a very fast colour." The specimens contained starch in an appreciable quantity, but apparently they possessed no special properties which would render them useful for dyeing purposes.

So far there is nothing to indicate that any of these Indigo plants, other than *Indigofera*, are likely to prove of commercial value. The ordinary indigo plants (either *I. tinctoria* or *I. Anil*), are already under cultivation by the natives, but the preparation is so crude and inefficient that the produce is not likely to compete successfully with Indian and other sources of Indigo.

The most promising plant, next to species of *Indigofera*, is no doubt that already mentioned as yielding Yoruba Indigo. In a paper, read before the Linnean Society [Journ. Linn. Soc., vol. xx., p. 404], Mr. Thiselton Dyer, F.R.S., gave an account of this plant, which, in view of the revival of the subject, it may be well to place within reach of correspondents and others interested in West African products :—

"It has long been known from the observations of travellers, that " the natives of the West Coast of Africa obtained an abundant supply " of Indigo from plants cultivated for the purpose. And, as the species " of the genus *Indigofera* have their head-quarters in the African " continent, it was not perhaps an unreasonable supposition that one " or more of them was the source of the dye in use amongst the " inhabitants of the West Coast.

"It was therefore with some surprise that I found amongst a " number of specimens received at the close of last year from Captain " Alfred Moloney, C.M.G., Administrator of the Gold Coast Colony, " a specimen of an arborescent leguminous plant, but obviously not an " *Indigofera*, marked as yielding a native Indigo. I drew Captain " Moloney's attention to the interest attaching to the matter ; and, as " the specimens received consisted merely of foliage, I urged him to " secure additional material sufficient for a botanical determination. " He replied to me, on April 10, from Lagos, as follows :—

"'I am glad to find I have sharpened your appetite as to the Indigo. " 'The country abounds with it ; but as the young shoots are the " 'parts from which the dye is made, you can realize the difficulty of " 'securing flower and fruit. I do not despair, however. . . . . . " '. . . . This tree might be largely developed here. It is climber, " 'and must be leguminous. The Yoruba for the tree is "Elu."'

"I placed Captain Moloney's material, such as it was, in the hands of " my colleague Professor Oliver, who unites to a knowledge of the " affinities of plants, which has become almost an instinct, an " acquaintance with the contents of the vast Kew Herbarium in which it is " safe to say that no human being will ever surpass him. He speedily " drew my attention to a specimen (3360) brought back from the Niger " expedition by Barter in 1859. It is accompanied by a manuscript " note, which I transcribe :—

"'Indigo of the Yoruba country. Leguminous shrub of twining " 'habit and large growth. Flowers in loose panicles, at first pink, " 'changing to a faded blue. Common near rivers ; plantations of " 'several hundred acres of this are about Abbeokuta. In cultiva- " 'tion the plant is kept about 7 or 8 feet high ; long shoots " 'are cut close, and it becomes short and spurred and bushy, like " '*Wistaria sinensis* when similarly treated. The leaves are gathered " 'young (as seen in the specimen), merely powdered in a mortar into a " 'black pasty state, made into balls the size of double fists, and dried " 'for the markets. In dyeing, one ball to a gallon of water is used ; " 'the cloth allowed to remain four days. The dye is fixed with " 'potash ; a fine deep blue is produced, very permanent.'"

It is most desirable that good specimens of the flowers and pods of the plant yielding Yoruba Indigo should be sent to Kew for further investigation. We trust that some of our correspondents on the West Coast will bear this in mind.

XXXV.—VANILLA.

The cultivation of Vanilla has been attempted in numerous tropical Colonies, but, with the sole exception of Mauritius and the Seychelles, it does not appear to have assumed an important position in any British Colony. This is due to a variety of circumstances. In some Colonies the climate may be unsuited to the successful growth of the plant, owing to seasons of extreme severity in droughts or heavy rains. In others, the soil may be too retentive. In most of them, the need which exists for artificially fertilizing the flowers of Vanilla, and the care necessary to properly cure the pods have, no doubt, contributed to retard the cultivation. There are, however, no valid reasons why the cultivation of Vanilla in certain portions, at least, of the West Indian Colonies, of British Honduras, of the West African Settlements, of India, Ceylon, and the Straits Settlements should not be successfully pursued. With that view, plants of Vanilla have been forwarded from Kew to certain Colonies where they did not previously exist, and it is proposed now to give very briefly the chief points bearing upon the industry.

The Vanilla plant is an orchid of climbing habit, of which there are probably several species under cultivation. The more common plant appears to be *Vanilla planifolia*, Andr. (*V. claviculata*, Sw.) Other species under cultivation are *V. aromatica*, Sw., and *V. grandiflora*, Eich. The botany of the plants yielding Vanilla requires to be carefully investigated. The specimens in the herbarium of this establishment in their present state throw little light on the subject. Hence, a good series of leaves, flowers, and fruits of plants yielding Vanilla, carefully dried, or preserved in spirit, would be a valuable addition to the collections.

It appears that *Selenipedium Chica*, Rchb. f. (Xenia Orchidacea, Vol. I., p. 3, t. 2), yields Vanilla on the Isthmus of Panama, which is described by Seeman (Botany of Herald, p. 215) as follows:—

" The fruit of this plant is highly esteemed as an aromatic by the
" inhabitants of the Isthmus [Panama], and used for all purposes for
" which real Vanilla is commonly used. It is termed 'Vanilla Chica,'
" or 'Little Vanilla,' because its fruit is very much smaller than that of
" any of the genus Vanilla found in the Isthmus."

Cultivation.—As regards starting a Vanilla plantation, it is important to bear in mind that the plants, being climbers, it is necessary to provide them with support of some kind, and generally, for this purpose, rough-barked trees, trellis-work, stone pillars, or stone walls are utilized. Living stems of rough-bark trees are probably the best supports for Vanilla. In Mauritius, the Seychelles, and Réunion, the stems of *Jatropha Curcas* are largely used. In addition to support, the Vanilla plants require a certain amount of shade. This, however, should not exceed what is called half-shade (*demi jour*). A certain amount of sun is, however, essential to the proper ripening of the pods. Whatever the support or nature of the shade may be, it is important to bear in mind that the Vanilla plants should be kept within easy reach of the cultivator, and not allowed to climb high up amongst the branches.

The ground around the support should be prepared by deep trenching to the depth of a foot or 18 inches. The drainage of the bed should be perfect. The most favourable soil consists of fine rich loam, mixed with equal parts of sand and leaf mould. Rich animal manure, or manure of any kind, is not a desirable addition. To renovate the soil at the end of the season, add some well-rotted vegetable mould or humus mixed with sand. Raise the bed about six inches above the surrounding surface and support by means of stones or rockwork. Where obtainable, the cuttings should consist of portions of stems about two or three feet long, but all the better if four or five feet long. The leaves are first removed from the lower part, and three joints are laid under the soil and covered to a depth of two or three inches. The upper part of the stem is trained against the support in the position in which it is intended to grow. A single tree will carry several Vanilla plants, depending upon its size. The surface of the bed should be kept moist by being covered with leaves or "mulching," and, in very dry weather, it should be regularly watered.

Thus started, Vanilla cuttings readily take root, and the stem will grow and flourish. Depending upon the size of the cuttings, the plants begin to flower in the second year after planting. They do not, however, flower freely until the third and fourth years.

Fertilization of the Flowers.—The first duty of the cultivator when the plants are in flower is to attend to the duty of fertilization which, in countries where the Vanilla is not a native, will require to be done artificially. The flower of the Vanilla, as in most orchids, is a very highly differentiated organ, the parts of which can be best studied by a reference to the engraving given on page 79. In the wild state, the pollen is carried to the stigma of the Vanilla flower by means of the agency of insects. Where these particular insects are absent, their work must be performed by the cultivator, or no Vanilla pods will be produced.

It is recommended that the work of fertilization should take place in the morning. It is advisable that all the flowers in a cluster be fertilized as they open; but of those that are successfully fertilized, only a certain number, depending on the age and strength of the vine, should be allowed to remain. If too many pods are retained at first, the vine is apt to be weakened, and the quality of the produce lowered.

The process of fertilization will be better understood by a reference to the engraving given herewith. The only instrument necessary is a small piece of bamboo or sharpened stick the thickness of a lead pencil, about four or five inches long.

When the flower is opened, it will be noticed that there are three outer and three inner floral parts, which are sometimes designated the sepals and the petals respectively. One of the latter is so much altered and so distinct in form and colour, that it is usually spoken of as the *lip*. Inside, and immediately hanging over the free part of the lip, is a process which is a continuation of the axis of the flower. This is called the column (*see* b, fig. 2). The end of the column enlarged, front view, is shown at fig. 4. At a, fig. 5, is represented the anther, containing the pollen masses, and at b, the stigma or viscid surface, on which the pollen must be placed in order to ensure the act of fertilization. At fig. 6 is represented a section through the top of the column showing the position of the pollen masses a, and the stigma b. It will be noticed that the stigma is separated from the pollen masses by an upper lip projecting over the stigma. In the work of fertilization it is necessary to lift up or tear away this lip, and transfer the pollen masses from the anther at a to the stigma at b, as shown in fig. 7. The mode of using the instrument is shown at figs. 2 and 3.

The work of fertilization, when once understood, may be carried on with great rapidity. An expert person will, it is said, fertilize as many as a thousand flowers in one forenoon. The simplest mode is to seize the flower with the left hand between the thumb and middle finger, and support the column at the back with the forefinger. Then, with the sharpened instrument in the right hand, the hood at the top of the

EXPLANATION OF PLATE.

Fig. 1.—Portion of stem of Vanilla plant, with leaf, aerial root, and cluster of flowers; *a*, front view of Vanilla flower; *b*, side view; *c*, aerial root, with root hairs.

Fig. 2.—Single flower of Vanilla, exhibiting the first stage in the process of artificial fertilization. The operator, provided with a finely-pointed piece of bamboo, divides the lip or labellum medially, so that the central lobe is separated from the two side lobes. This exposes the column and organs of fecundation. The instrument is represented as placed against the column, ready to press upwards the anther *a*, and bring the pollinia in contact with the stigma *b*.

Fig. 3.—Single flower of Vanilla, exhibiting the second stage in the process of artificial fertilization; *b* shows position of column exposed by division of the lip [the middle lobe of lip is pulled forward and curled upon itself to show the position of the column; the side lobes of lip, separated as shown in Fig. 2, are represented at back of the column]; *a*, the position of pollen masses, taken from the anther and placed on the stigma.

Fig. 4.—Enlarged front view of top of the column; *a*, the anther.

Fig. 5.—Enlarged side view of top of the column; *a*, the anther; *b*, the stigma, or viscid surface on which the pollen masses must be placed to ensure fertilization.

Fig. 6.—Enlarged section through top of the column; *a*, one of the pollen masses *in situ*; *b*, the stigmatic cavity.

Fig. 7.—Enlarged section through top of the column; *a*, the pollen masses, having been transferred from *a*, Fig. 6, are now represented in contact with the stigmatic surface. [Although diagrammatically shown, these figures give a tolerably good idea of what is actually necessary in order to produce fertilization in a Vanilla flower.]

a
1
b
a
b
c
c
2
a
b
3
a
4
a
b
5
a
b
6
a
7

Fertilization of Vanilla flower (Delteil).

column is removed, so as to expose the anther and stigma. The upper lip of the stigma is then pressed upwards, and the anthers brought down and placed in contact with stigmatic surface, as shown in figs. 3 and 7. The explanations given to the figures in the engraving will clearly show the operations here described. When the flowers have been fertilized they will begin to wither about the third day. By the end of the first month the fruit attains nearly its full size, although it is not fully developed until it is six or seven months old.

Curing the Pods.—The pods are left on the vine until they begin to show a slight yellow tinge at one end. They are then gathered from day to day, care being taken not to injure those not yet fit to gather. When the day's gathering is completed, the pods are placed in a basket, and, according to one method of preparation, they are plunged for about half a minute in very hot, but not actually boiling, water. Directly after this operation the pods are spread out on mats to drain. For the next six or eight days they are exposed on woollen cloths or blankets in the sun, while each night they are kept in a closed box, where they undergo a certain amount of fermentation. When they have become soft and brown, the pods are placed to dry in the shade, they are carefully and regularly pressed between the fingers, slightly anointed with oil, and rendered supple and lustrous. When quite cured, the pods are of a rich dark chocolate colour, pliable in texture, and perfectly free from moisture. The whole process of curing extends over several weeks.

In packing for the market, the pods are sorted according to length, and put up in packets of 50 pods each; they are tied in the middle, and also near each end. These packets are then carefully put up in closely fitting tin boxes. When Vanilla pods are in good condition, they become covered with an efflorescence of needle-like crystals of Vanillic acid. The interior of the bean is then soft, unctuous, and balsamic.

Those who wish to carefully study the various modes of growing and curing Vanilla, cannot do better than consult *Vanilla, its Cultivation in India*, by J. E. O'Connor, Calcutta, 1881; and *La Vanille, sa Culture et sa Préparation*, par A. Delteil, Paris, Challamel Ainé, 2, Rue Jacob, 1884.

Vanilla plants have been frequently grown and fruited in this country at Kew, at Sion House, and other establishments. In 1878, some bunches at Sion House contained as many as fifteen pods, each of which measured nine inches in length.

Mr. Piesse gives the following interesting information respecting the use of Vanilla pods for perfumery purposes:—

" In order to obtain the perfume or essence, ½ lb. of such pods are cut " up small, and put into one gallon of pure alcohol, of a strength known " as 60° over proof, giving the whole a shake-up daily. The ingredients " must remain together for, say, four weeks, at which time all that is " worth extracting will be found in the spirit, which may then be " strained off quite clear and bright. It is then suitable as a flavouring " agent, or, when blended with other scents, it makes delicious per-" fumery. Those sold under the titles of clematis, heliotrope, wall-" flower, &c., mostly contain about one half in bulk of Vanilla extract. " About two centuries ago, Vanilla may be said to have been unknown " in this country; it is, however, stated that Morgan, an apothecary, " showed to Queen Elizabeth a sample, but he knew nothing more about " it than that 'it was brought from abroad by some Spanish mer-" chants.' At the present time the total annual average crop of all the " varieties of Vanilla from the several countries which produce it " may be estimated at 80,000 lbs., representing a value of not less than " 150,000*l*."

XXXVI.—STREBLUS PAPER.

(*Streblus asper*, Lour.)

The preparation of paper and even cloth from the bark of the Paper Mulberry (*Broussonetia papyrifera*) is a circumstance which is well known. Various specimens, illustrating the uses of the bark of this plant, exist in the Museums of Economic Botany at Kew from China, Japan, and the Pacific Islands. It appears that in Siam paper very similar in character to that prepared from *Broussonetia*, is obtained from *Streblus asper*, Lour. This latter is a tree widely distributed throughout India, Ceylon, and tropical Asia, where it is known under a variety of native names. It does not appear, however, that it is used for paper making to any appreciable extent in any country except Siam.

The following correspondence, which has taken place between this establishment and the Foreign Office, contains practically all the available information on the subject :—

"Kew, 25th April 1887.

"I have the honour to inform you that I observe in the Paper " Makers' Monthly Journal an account, based on information acquired " by the late Sir Richard Schomburgh, of the manufacture of paper in " Siam from the bark of *Streblus asper* (otherwise *Trophis aspera*), " a tree locally known as Ton-Khoi.

"It is stated that legal documents and Government correspondence " are written on paper made from this material. Black paper, written " upon with talc, is also stated to be used for rough drafts.

"The tree is a common one in the East generally, and it therefore " seems worth while to obtain some information about its use in the " manufacture of paper. The Museum of the Royal Gardens possesses " no specimens illustrative either of the raw material or of the product " derived from it.

"I venture, therefore, to express the hope that the Secretary of " State will approve of the kind offices of the Minister Resident at " Bangkok being invited to assist this establishment in procuring " specimens (1) of the raw material in its several stages; (2) of any " characteristic implements employed in the manufacture; (3) of " finished samples of the paper.

"It would be also desirable that the collection, if made, should be " accompanied by a dried specimen of the foliage, and, if possible, " flowers of the tree, in order to make the identification perfectly " secure. Any moderate expense incurred will be defrayed by this " establishment in usual course.

"W. T. THISELTON DYER."

"Foreign Office, 10th December 1887.

"With reference to your letter of the 26th instant, I am directed by " the Marquis of Salisbury to transmit to you a despatch from Her " Majesty's Chargé d'Affaires at Bangkok, forwarding a report of the " manufacture and uses of Ton Khoi paper.

"P. W. CURRIE."

"Bangkok, 28th October 1887.

"IN obedience to instructions contained in your Lordship's " despatch, No. 21, of 29th April 1887, I have now the honour to " enclose a report, prepared by Mr. Beckett, Student Interpreter of

" this Legation, with regard to the manufacture of paper from the bark " of the tree called 'Ton Khoi.'

"Under my direction Mr. Beckett has made several visits to a " village where the paper is manufactured, and has procured as many " as possible of the specimens required by the authorities at Kew " Gardens.

"These specimens have been placed in two cases addressed to Kew.

"E. B. Gould."

"Ton Khoi," its Manufacture and Uses.

Mr. French, in his commercial report for the year 1885, in describing the process of the manufacture of native paper, writes as follows :—

"Native paper is manufactured out of the bark of a tree called " 'Ton Khoi.' The process of manufacture is simple. The smaller " branches of the tree are cut, and steeped in water for two or three days. " The bark is then stripped off, and brought in bundles and sold to " persons who make the paper. The bunches of bark are put in water " for two or three days by the paper maker, and, having been cleansed " from dirt, are taken out and steamed over a slow fire for two days, a " little clean stone lime being sprinkled through the bark. It is then " steeped in water in earthen jars, and more lime is added. After a " few days it is taken out of the jars, and, having been well washed to " free it from the lime, it is beaten with a wooden mallet [for about " two hours] until it becomes a mass of soft pulp. A frame of netting " about six and a half feet long, and of width varying from eighteen " to five inches, is set afloat in water, and the pulp, having first been " again mixed up in water, is skilfully poured out on to the frame so " as to be equally distributed over it. The frame is then lifted out of " the water, and a small wooden roller is run over the surface of the " pulp. By this process the water is squeezed out and the pulp pressed " together. The frame with the pulp on it is then set to dry in the " sun. In the course of some ten hours it is quite dry, and the sheet " of paper can then be lifted off the frame. It now only remains to " smooth the surface. This is done by applying a thin paste of rice " flour to the surface, and then rubbing it down with a smooth stone.

"A black paper, which is written on with a slate pencil, is made by " colouring the surface with a mixture of charcoal."

The process of the manufacture having been thus described, some additional facts regarding the tree itself, and the various uses of the paper, may prove of interest.

The place at which most of the native paper industry is carried on lies on the left bank of the River Mĕnam, between six and seven miles from Bangkok, consisting of a cluster of attap houses built on piles over the river and a creek which runs through their midst.

The average height of the "ton khoi" is about 30 feet. The branches grow in an irregular and straggling manner. The leaves are dark green in colour, oval in shape, and acuminated, with a serrated edge. The petiole of the leaf is very short, the venation is reticular, and there is but a single midrib.

The fruit, which is ripe during March and April, is small and dry, and is not put to any use by the natives of Siam.

The bark, in addition to being employed in the manufacture of paper, is used by native doctors for medicinal purposes. It is boiled with a large portion of salt, and, when reduced to a pulpy state, it is supposed to allay pain, especially in the teeth, when applied internally to the affected part.

The native name for the frame of netting into which the pulp is poured is "Phaneng," the price of which is one tical (2*s.*). The price of a sheet of the paper, as it is taken off a frame 6′ 1¼″ × 1′ 1″, is one fnnang, equivalent to 3*d*. English money.

A paper of a thinner texture is also manufactured, the fineness of the texture depending on the greater or lesser admixture of water with the pulp of the "ton khoi" bark when placed in the frame of netting. This thin paper is now falling into disuse, and is gradually being relegated to remote districts of Siam, and to use by the poorer classes.

The black paper mentioned in Mr. French's Report, and of which also specimens and samples are enclosed, is made of the outer and darker peelings of the bark, whilst the white is produced from the interior lining. The paper made of the outer peelings, after undergoing the same process as the white, is smeared with a liquid mixture obtained by boiling the charcoal of the tree or shrub called "Ton Sanoh" with a certain quantity of rice. When folded in the shape of books of the better quality, the paper is usually covered with a double coating of this mixture.

The "Ton Sanoh" above mentioned is a shrub growing to the height of some 8 or 10 feet, and is of a pithy nature.

The method of writing on white paper is either by the use of a European pen and ink, or, better, by means of a native pen formed of a small piece of split bamboo, hollowed along the centre, and tapering to a point. This latter is used with Chinese ink (the same as Indian ink), which is sold in sticks at prices varying from 1½*d*. to 6*d*. a stick. To write permanent characters on the black paper requires a no mean degree of skill and practice. The pen used is the same as the one used for writing on white paper, the liquid employed being a mixture of lime either with the sap of the "ton makhuit" (a species of gum) or with a kind of chalk called by the natives "horadan." After the writing has been impressed on the paper, the whole is smeared with a coating of varnish obtained from the "ton jang," in order to fix the characters and prevent erasures.

The black books are extensively used in the native law-courts for the taking of evidence, &c. The evidence is written down by means of a chalk or steatite pencil, and is capable of easy erasure should any emendations be required. It is then read over to the witness or other person, as the case may be, and bound round with string, a seal of mud being affixed on the centre, in order to prevent the opening of the document until it is required at the trial. The witness then makes a mark in the mud seal with his nail, or, according to a more recent custom, is given a small wooden seal, with which he stamps the mud, and which he carefully preserves for the day of trial.

A scale of prices of the various kinds of paper sold is subjoined, the numbers corresponding with the numbers docketed on the samples forwarded, viz.:—

							s.	*d.*
Book	No.	I.	(white),	equal to	5	phanengs	=1	3
„	„	II.	„	„	4	„	=0	9
„	„	I.	(black)	„	5	„	=2	0
„	„	II.	„	„	2	„	=0	4½
„	„	III.	(unfinished),	„	4	„	=0	9
„	„	IV.	(inferior quality)				=0	2

Samples of the bark in its different stages of manufacture are also forwarded, numbered and marked according to the successive stages through which it passes before its appearance in paper form; also specimens of the leaf, and of such other objects that bear upon or illustrate the manufacture of native paper as I have been able to procure.

W. R. D. Beckett.

The specimens illustrating the industry which have been deposited in the Kew museums are as follows:—

Section of trunk of tree; a frame of netting; native books, white and black; samples of material in various stages of preparation; hammer for beating bark; and mixing pot, with pigments and pens for writing.

Kew, 30th December 1887.

I have the honour to acknowledge the receipt of your letter of December 10th, transmitting a despatch in original (herewith returned) from Her Majesty's *Chargé d'Affaires* at Bangkok, forwarding a report on the manufacture and the uses of paper from *Streblus asper*.

The cases of specimens have been duly received. The collection is extremely interesting and instructive, and the objects transmitted are a very desirable accession to the museum of this establishment, where this curious industry has hitherto been wholly unrepresented.

I venture to express a hope that the Secretary of State will be pleased to convey to Mr. Gould an intimation of his satisfaction at the courteous and very intelligent manner in which Mr. Gould has assisted this establishment.

It is proposed to publish the report in an early number of the "Kew Bulletin."

W. T. Thiselton Dyer.

XXXVII.—URERA FIBRE.

(*Urera tenax*, N.E. Br.)

The fibres exhibited in the Natal Court at the late Colonial and Indian Exhibition attracted a good deal of attention. Unfortunately the labels had become misplaced in transit, and consequently the collection did not offer such facilities as could be desired for detailed investigation. It is now clearly established, however, that a fibre marked "*Hibiscus*," which attracted chief attention, was really what is known in Natal as native hemp, possibly a local form of *Cannabis sativa*. In the Official Reports, p. 378, it is stated by Mr. C. F. Cross, "that the "yarn prepared from this fibre was of a greyish colour, bleaching easily "under the ordinary treatment to a full white. It was remarkably "soft to the touch, more nearly resembling an Angola yarn than flax "or cotton. This fibre has been submitted to flax-spinners of expe-"perience, and from inspection, together with the results of laboratory "investigation, they have formed a high estimate of its value."

Mr. J. Medley Wood, A.L.S., the indefatigable Curator of th Botanic Gardens at Durban, to whose zeal and co-operation we are indebted for the elucidation of many problems connected with the flora of Natal, mentions that this native hemp grows vigorously to a height of six feet or more, and that it lends itself readily to the exigencies of culture.

M. S. del et lith.

Urera tenax, N.E.Br.

The next most interesting fibre exhibited in the Natal Court appears to have been forwarded by Mr. J. Kirkman, of Umzinto. It was stated by Mr. Wood to belong to the natural order *Urticaceæ*, but he had at that time been unable to obtain either fruit or flowers, and it was unrepresented in the herbarium at Durban.

Of nettles in Natal he states :—

"There are several indigenous varieties, some of which attain a
" height of over twenty feet, with a pithy semi-herbaceous stem eight
" inches in diameter. Others are more or less dwarfish, being but half
" an inch thick and four to five feet high. The barks of all the varieties
" are highly prized by the natives on account of the strong cord or
" thread they make, in their own rude manner, from the fibre contained
" therein. It is known to them by the name "*imbogo sempi*."

In a letter, dated 23rd August 1887, Mr. Woods writes :—

"By this post I send flowers of my No. 3,837, which appears to be a
" *Urera*. It is a shrub about 8 to 10 feet high or more, and is, I
" think, the plant producing the fibre which was said to be the second
" best fibre shown at the late Colonial and Indian Exhibition.

" The plant is not uncommon in the midland districts, but this is
" the first time that I have seen the flowers.

"It will be important, I think, to ascertain whether its fibre is
" really of value; it grows readily from cuttings, and could be grown
" in quantity if found to be payable."

Again on the 23rd November :—

"I have collected a quantity of seed for distribution, also staminal
" flowers, of my No. 3,837, *Urera sp.*, but I am afraid that they are
" scarcely recognisable. A specimen of bark shall be sent by next
" week's post. I should like to have sent a larger quantity, but the
" messenger I sent said that the trees had been stripped by the natives,
" who use the bark for making their sleeping mats. I am having the
" plant propagated here, in case it may be in demand."

On investigation at Kew, the plant sent by Mr. Wood proved to be a new species, which has been described and figured in the *Icones Plantarum* as *Urera tenax*, N.E. Br.

The bark, as sent here, appears to resemble in many respects that of uncleaned *Ramie* or *Rhea* (*Bœhmeria nivea*). The fibre is, however, more brittle and not so lustrous as the best specimens of China grass. Unfortunately the sample hitherto received does not admit of this new fibre being treated in an exhaustive manner. It is quite possible that an indigenous plant of this character may be better suited to the circumstances of Natal than the China grass. On receipt of a larger sample, it will then be possible to investigate its merits in an exhaustive manner.

We are enabled, by permission of the Bentham Trustees, to add a plate of this Natal fibre plant.

XXXVIII.—TEA.

(*Camellia theifera*, Griff.)

JAMAICA TEA.—Recently, three samples of tea grown and prepared at the Government Cinchona plantations, Jamaica, at an elevation of 5,000 feet, were forwarded to Kew by Mr. W. Fawcett, F.L.S., Director of Public Gardens and Plantations. An account of the experiments in tea culture at Jamaica is given in the Annual Report of the Botanical Department for the year 1884, pp. 45, 46. The first plants of tea grown at Jamaica were supplied from Kew in 1869 (*see* Kew Report, 1877, p. 21).

In 1883, and again in 1884, seeds of Assam hybrid tea were obtained by Kew from the Lebong Tea Company and the Kungra Valley Tea Association, and these enabled the Botanical Department to extend the plantations already existing, and distribute plants of this sort amongst Cinchona planters. These experimental plantations in Jamaica are the only tea plantations in the New World, and if tea were prepared to supply only local requirements there is a possibility of the industry being successfully established in the island. Various samples of Jamaica tea have been prepared from time to time, and very favourable reports have been received respecting them. It is said, "that the liquor "of all the Jamaica teas is very serviceable for the London market," and it only remains for some local effort to be made to determine the practicability of establishing an industry on a satisfactory basis. The following very promising reports on the samples of Jamaica tea sent by Mr. Fawcett have been kindly furnished to this establishment by a firm of tea merchants in the City:—

13, Rood Lane, 31st December 1887.

SAMPLE NO. 1.—UNASSORTED TEA.

The dry leaf is well rolled, but is much too grey in colour, and wanting in tip, somewhat uneven, and inclined to be dusty. The liquor is fairly dark and full, with some flavour. The infused leaf is regular, and of a fairly bright colour. Value, 1*s.* per pound.

SAMPLE NO. 2.—UNASSORTED TEA.

The dry leaf is good colour, but is too crinkley, and has not been properly rolled. The liquor is dark and full, and of a nice flavour. The infused leaf is regular, and of a fairly bright colour. Value, 1*s.* 2*d.* per pound.

SAMPLE NO. 3.—BROKEN ORANGE PEKOE.

Dry leaf is good colour, and with a few tips, but is rather open, ragged, and too uneven. The liquor is dark, full, and of good flavour. The infused leaf is bright and regular. Value, 1*s.* 8*d.* per pound.

GENERAL REMARKS.

The above teas are chiefly valuable in the London market on account of their liquors, the manipulation of the dry leaf being faulty. We prefer the samples marked Nos. 2 and 3, the leaf being better in colour and liquors of finer quality and flavour. No. 1 is too soft in liquor, and resembles China tea; Nos. 2 and 3 being more like Ceylon tea.

All the samples have a peculiar smell, and taste of some substance quite foreign to tea; for this defect we have made due allowance in our report.

The leaf of No. 2 is quite *limp*, instead of being crisp; the sample has been damaged in transit.

GOW, WILSON, & STANTON.

MADAGASCAR TEA.—The following correspondence has been forwarded to this establishment respecting experimental tea cultivation at Madagascar:—

Foreign Office, 29th September 1887.

I am directed by the Marquis of Salisbury to transmit to you herewith a copy of a letter from Mr. Pickersgill, Her Majesty's Vice-Consul at Antananarivo, to Mr. Haggard, Her Majesty's Consul in Madagascar, on the subject of tea plantations in the interior of that Island.

P. W. CURRIE.

Antananarivo, 6th May 1887.

I have the honour to inform you that an experiment in the cultivation of the tea plant in this country is being made by His Excellency the Prime Minister at one of his orchards situated about 2 miles from Antananarivo, and that there seems to be reason to believe the result will be very encouraging.

I visited the orchard a few days ago, and found nearly 200 plants in a healthy condition. They have all been raised from a small packet of seeds obtained from the Curator of the Botanical Gardens of Mauritius, and a number of them are already 18 inches high, although it is not yet 12 months since the seed was sown. If the tea plant would be successfully made to clothe the bare hills of Imerina, the preparation of the leaf and the exportation of the marketable product would afford an opening for European capital which would be well worth a trifling outlay now in the promotion of extended efforts to introduce this culture.

The publication of the present brief notice of what is an experiment made under favourable circumstances might possibly lead some one interested in the tea trade to furnish a quantity of seed direct from India or China.

I should be happy to receive and distribute such contributions to the possibilities of prosperity in Madagascar.

W. C. PICKERSGILL.

NATAL TEA.—The first plants of tea which reached Natal were sent from Kew in 1850. They were cultivated by the late Mr. Plant in the Durban Botanic Gardens. The young plants raised from the seed of these were distributed in the Colony, and laid the foundation of the present tea industry in Natal. We are informed by Mr. Brickhill, of Prospect, Umbilo, that he obtained 100 plants of the earliest seedlings, many of which are still growing with him. It is probable that these were China tea, or plants offering well marked characteristics of China tea. The results of the experimental culture of these plants showed very clearly that the climate and soil of Natal were suited for the growth of tea, and in 1877 seed of Assam Hybrid and Assam Indigenous were imported by private planters. We are informed that the prospects of tea growing were so good at this time that "the " Planters' Association memorialised the Government to bring over " from Calcutta in coolie ships, freight free, seed of Assam tea. This " the Government agreed to do. Several boxes were imported, and

" from the first batch of seeds about 5,000 plants were raised. In
" 1880 the first real tea field was planted, a field of five acres containing
" 10,000 plants. In 1886 the total area under tea cultivation was
" about 600 acres, and the amount of tea produced was about 57,000
" pounds. It was expected last year that the amount of tea produced
" would be 100,000 or 120,000 pounds."

It may be pointed out that the extent of country supposed to be suitable for tea culture in Natal is confined to a belt about 12 miles wide, running parallel to the sea. Tea has, however, been tried further inland, upon land 40 or 50 miles from the sea, where there is liability to frost, and so far it has proved successful.

The tea industry in Natal is practically in its infancy, but the results so far attained are very promising. Mr. A. G. Stanton, in the Report presented to the Royal Commission, refers to the tea exhibits in the Natal Court at the Colonial and Indian Exhibition as follows :—

"The thirty-seven samples shown in the Natal court are representa-
" tive of teas ordinarily used in commerce. They are indicative of
" much promise for the future success of the enterprise. Good seed
" has evidently been planted, and much care bestowed upon the
" manipulation of the tea. The dry leaf is for the most part well
" made, and bears evidence not only of a knowledge of manufacture
" but also of careful supervision. The liquors are of fair useful quality,
" and possess the elements for excellent tea. As a rule, they are too
" highly fired or *burnt*, a fault which requires but to be known to be
easily remedied."

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ROYAL GARDENS, KEW.

BULLETIN
OF
MISCELLANEOUS INFORMATION.

No. 16.] **APRIL.** **[1888.**

XXXIX.—NEW GARDEN PLANTS.

The number of new garden plants annually described in various English and Foreign periodicals renders it a matter of considerable difficulty to botanists and horticulturalists to keep them in view.

As long ago as 1860 a list of new garden plants was published in the *Gardeners' Year Book and Almanack*, and this list was continued regularly until the *Year Book and Almanack* of 1886, which contained the new plants of the year 1885. The new plants up to October 1886 were published by instalments in the columns of the *Journal of Horticulture* during the months of January to May 1887 inclusive. Since that time no list of new plants has been published, and it is believed that it is no longer likely to be issued by private enterprise.

As the publication of a list of new garden plants is of the greatest possible interest to Botanical establishments everywhere, and as such a list would give information respecting many new plants grown at Kew, and distributed, in course of exchanges, to correspondents in all parts of the world, it has been determined to continue the list as one of the regular issues of the *Kew Bulletin*. It is believed that such a publication will be of service to the horticultural world generally.

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1888.
Price Twopence.

The present list embraces the new garden plants and alteration of names recorded between 1st October 1886 and 31st December 1887. To these have been added the names of authors, which did not appear in former lists. The full description of hybrids of garden origin and of garden varieties is not given, as otherwise the list would exceed the moderate limits within which it is necessary to confine it.

The publications from which the list is compiled are indicated by the abbreviation which immediately follows the name. They are:—Botanical Magazine, *B. M.*—Gardeners' Chronicle, *G. C.*—Gartenflora, *Gfl.*—Illustration Horticole, *Ill. H.*—Lindenia, *L.*—Reichenbachia, *R.*—Revue Horticole, *R. H.*—Warner and Williams' Orchid Album, *W. O. A.*—Warner's Select Orchidaceous Plants, *W. S. O. P.*

The abbreviations in the descriptions of the plants are:—*Infl.*, Inflorescence.—*L.*, Leaves.—*Fl.*, Flowers.—*Fr.*, Fruit.—*H.*, Hardy.—*H. H.*, Half-hardy.—*G.*, Greenhouse.—*S.*, Stove.—*Per.*, Perennial.—*Shr.*, Shrub.—*In.*, Inches.—*Lin.*, Line = one twelfth of an inch.—*Ft.*, Foot or Feet.—*Diam.*, Diameter.—*Pet.*, Petals.—*Sep.*, Sepals.

N.B.—Unless specified, all Orchids and Bromeliads may be considered to be stove epiphytes.

Abelia rupestris, var. **grandiflora,** André. (*R. H.* 1886, p. 488.) Caprifoliaceæ. H. shr. Garden variety.

Abies Nordmanniana, var. **horizontalis,** Carrière. (*R. H.* 1887, p. 151.) Coniferæ. H. tree. Garden variety.

Acanthus Caroli-Alexandri, Hausskn. (*Gfl.* 1886, p. 626–635, f. 73–75.) Acanthaceæ. H. per., with a lax rosette of a few lanceolate, pinnatifid, spinose toothed radical l., growing to about 16 in. long by 3–4 in. broad, and a stem 9–18 in high, with 2–4 similar l., and ending in a dense spike of white fl., often suffused with rosy. Greece.

Acer palmatum, var. **dissectum roseo-pictum.** (*Gfl.* 1886, p. 569.) Sapindaceæ. H. tree. Garden variety.

Acer platanoides, var. **integrilobum,** Zabel. (*Gfl.* 1887, p. 431, f. 107–108.) H. tree. Garden variety.

Acer platanoides, var. **undulatum.** Carrière. (*R. H.* 1887, p. 63.) H. tree. Garden variety.

Achillea rupestris, Huter. (*B. M.* t. 6905, *R. H.* 1887, p. 166.) Compositæ. H. per. A pretty alpine plant of dwarf tufted habit, with rosettes of linear-spathulate, obtuse, pubescent, entire greyish-green l., and sparsely leafy stems, 4–6 in. high, with small corymbs of small white fl.-heads. with very broad ray florets. South Italy.

Adesmia balsamica, Bert. (*B. M.* t. 6921.) Leguminosæ. G. A very beautiful floriferous shr., much branched, branches slender. L. small pinnate. Fl. in lax racemes, bright golden yellow, about ½ in. in diameter. Pod 1 in. long, with 6–8 rounded joints. Chili.

Adiantum assimile, var. **cristatum,** Bull. (*Bull Cat.*, p. 9.) Filices. G. A form with elegantly-crested fronds. Victoria.

Adiantum Burnii, T. Moore. (*G. C.* 1887, v. 1, p 447.) Garden variety.

Adiantum capillus-veneris, var. **digitatum,** T. Moore. (*G. C.* 1887, v. 1, p. 547,) and var. **imbricatum,** T. Moore. (*G. C.* 1887, v. 1, p. 547.) H. or G. Garden varieties.

Adiantum cyclosorum, T. Moore. (*G. C.* 1887, v. 1, p. 547.) S. A handsome and well-marked deciduous species. Fronds 1½–2 ft. long, triangular, tripinnate, glabrous; pinnæ spreading ovate, stalked; pinnules rather large, 5–9 lines long, rhomboid, bearing 8–10 large, circular, marginal sori. Ecuador.

Adiantum Daddsii, T. Moore. (*G. C.* 1887, v. 1, p. 42.) G. Garden hybrid.

Adiantum festum, T. Moore. (*G. C.* 1887, v. 1, p. 110.) G. Garden hybrid.

Adiantum fragrantissimum, Henderson. (*G. C.* 1887, v. 1, p. 447, and v. 2, p. 198–9, f. 49.) S. Garden variety.

Adiantum hians, T. Moore. (*G. C.* 1887, v. 1, p. 41.) S. An ornamental Maidenhair Fern, with triangular-ovate tripinnate fronds having black stipes. Pinnules variable, roundish, balloon-shaped transversely oblong, or rhomboidal, the end rounded, bearing 1–2 large, broadly gaping sori. New Caledonia.

Adiantum Oweni, T. Moore. (*G. C.* 1887, v. 1, p. 110.) G. Garden hybrid.

Adiantum Waltoni, T. Moore. (*G. C.* 1887, v. 1, p. 111.) G. Garden variety.

Æchmea flexuosa, Baker. (*G. C.* 1887, v. 1, p. 8.) Bromeliaceæ. S. epiphyte, one of the largest of the genus, with a rosette of 20–30 large horny l., 3 ins. broad, bright green spotted with whitish, prickles small and pale. Fl.-stem about 3 ft. high, panicle lax, ovate, with zigzag ultimate branchlets. Fl. distant; sessile glabrous; calyx and ovary pale pink, pet. bright red. Mr. Baker has now identified this with **Æ. spectabilis.** Brongn.

Æchmea mexicana, Baker. (*G. C.* 1887, v. 1, p. 8.) S. epiphyte. A fine handsome species, with a dense rosette of 20–30 l., 2 ft. or more long, 3 ins. broad, with a deltoid-cuspidate tip, pale green spotted with darker green, prickles small. Fl.-stem 2 ft. high, densely mealy; panicle oblong-cylindrical, 4–5 ins. broad. Calyx and ovary green, densely mealy, petals bright crimson. Mexico.

Æchmea myriophylla, Baker. (*B. M.* t. 6939; *G. C.* 1887, v. 2, p. 108.) S. A distinct-looking species with a dense rosette of narrow, attenuate, channelled l., 2–2½ ft. long, 1 in. broad, armed with close brown prickles on the margins, dull green, sprinkled with silvery scales on the back. Fl.-stem 1½ ft. high, panicled above, and as well as the bracts and calyces bright red. Fl. distichous, pink fading to lilac. Trop. America.

Æchmea Weilbachii. var. **leodiensis,** André. (*R. H.* 1887, p. 31). S. epiphyte. A var. with a rosette of about 40 l. armed on the basal half with more crowded and larger spines than in the type, upper surface dark olive and bright green, beneath with the basal part washed with violet-brown and spotted with blood-red. Fl.-stem shorter than the l. Bracts scarlet, mixed with violet and green. Fl. smaller than in the type. Brazil.

Aerides odoratum, var. **birmanicum,** Rchb. f. (*G. C.* 1887, v. 2, p. 272.) Orchideæ. A small-flowered var. with only a light purple line at the tips of the lateral sep., and the mid lobe of the lip very narrow and purple. Burmah.

Aerides quinquevulnerum, var. **Schadenbergiana,** Stein. (*Gfl.* 1886, p. 606.) A var. of more compact habit with shorter and broader l. than in the type.

Aerides virens, var. **Ellisii,** Williams. (*W. O. A.* v. 7, pl. 298.) A strong-growing form with longer racemes than in the type, being 18–20 in. long. Sep. and pet. white with amethyst tips. Lip white, with the side lobes and base of the spur spotted with amethyst, the middle lobe rich amethyst, and the tips of the spur greenish. Java.

Agalma vitiensis, Seem. (*Gfl.* 1887, p. 71, **Agalina** by a misprint.) Araliaceæ. S. shr. with digitate l., the leaflets obovate-oblong, obtuse, narrowed into the petiole, entire, with horizontally spreading veins. Umbels 3–7 flowered. Fiji.

Agave Henriquesii, Baker. (*G. C.* 1887, v. 1, p. 732; and v. 2, p. 307, f. 70.) Amaryllidaceæ. S. succulent, intermediate between *A. xylonacantha* and *A. horrida.* Acaulescent. L. 2 ft. long, 5 in. broad, oblong-lanceolate, bright green, margined with a dark brown horny border, and armed with broad based prickles ¼ in. long. Fl.-stem 12–14 ft. high, the spike-like panicle occupying half of it. Ovary green, above 1 in. long, fl. with a very short tube, and lanceolate segments an inch long, tinged with brown. Mexico?

Agave Morrisii, Baker. (*G. C.* 1887, v. 1, pp. 543 and 549, f. 105.) S. succulent, allied to *A. americana,* but the l. are larger, 6–7 ft. long, and nearly 1 ft. broad, not glaucous, not so thick, and with smaller prickles. Fl. stem 15–20 ft. high, with 30–50 candelabra-like branches. Fl. 2–2½ in. long, bright yellow. Jamaica.

Agave Villarum, André. (*R. H.* 1886, p. 465.) S. Garden hybrid.

Aglaonema nebulosum, N. E. Br. (*Ill. H.* v. 34, p. 67, pl. 24.) Araceæ. S. foliage per, much like A. pictum, having short broad sheaths to the petioles, and oblong or obovate-oblong l., obliquely and somewhat abruptly acuminate at apex, obtuse at the base, bright dark green irregularly blotched with whitish-green. Java.

Allamanda cathartica, var. **Hendersoni.** (*Gfl.* 1887, pp. 554 and 560–1, f. 142.) Apocyneæ. S. Garden variety. Syn *A. Hendersoni.*

Allium elatum, Rgl. (*Gfl.* 1887, p. 369, t. 1251.) Liliaceæ. H. bulb with large, oblong, obtuse l., 8–12 in. long, 2–4 in. broad. Scape stout 3 ft. or more high, with a large globose head of numerous purple fl., with spreading, oblong, obtuse segments. Central Asia.

Alocasia Chantrieri, André. (*R. H.* 1887, p 465, f. 92.) Araceæ. S. Garden hybrid.

Alocasia eminens, N. E. Br. (*G. C.* 1887, v. 1, p. 105.) S. A fine bold-habited species allied to *A. Thibautiana.* L. peltate, ovate-sagittate, growing to 20–22 ins. long, by 9–10½ ins. broad, dark green above, purple beneath on petioles 3½–4½ ft. long. Peduncles, 12–18 ins. long., light green. Spathe, 5–5½ ins. long., with a light green tube, and a reflexed, oblong, acute, pale greenish-white limb. Spadix creamy-white. Malay Archipelago, Borneo ?

Alocasia Luciana, Rodigas. (*Ill. H.* v. 34, p. 75, pl. 27.). S. Garden hybrid.

Alocasia margaritæ, Lind. and Rod. (*Ill. H.*, v. 33, p. 155, pl. 611.) S. foliage plant, well distinguished by its pubescent brownish purple petioles ; the large blade of the leaf is cordate - sagittate acute, repand, rather thick, somewhat bullate, dark green, with blackish nerves. Java.

Alocasia marginata, N. E. Br. (*G. C.* 1887, v. 2, p. 712.) S. foliage plant of bold habit. Petioles 2–3½ ft. long, pale green, marked with zig-zag blackish-brown bars, and the sheath broadly margined with the same colour. Blade of l. 1½–2 ft. long, 11–14 in. broad, broadly cordate-ovate, margin slightly sinuate, apex shortly pointed, basal lobes oblong, obtuse, with a deep narrow sinus between them ; upper surface dark green, dull leaden-green, or purplish tinted beneath. Peduncle 9–10 ins. long, pale rose - tinted, faintly barred. Spathe 6–7 ins. long, the tube green, marked with blackish lines and dots, limb boat-shaped, greenish-white. Spadix as long or longer than the spathe. Brazil.

Alocasia Pucciana, André. (*R. H.* 1887, p. 466.) S. Garden hybrid.

Alocasia Villaneuvei, Linden and Rod. (*Ill. H.* v. 34, p. 59, pl. 21.) S. A large, bold-habited foliage plant, having the petioles spotted with brown, and the large ovate, cordate-sagittate l. of a bright dark-green. Borneo.

Alpinia zingiberina, Hook. f. (*B. M.* t. 6944, *G. C.* 1887, v. 2, p. 108.) Scitamineæ. S. per. of economic value. Rhizome stout, irregularly branched. Stems 4–5 ft. high, leafy. L. 10–12 in. long, oblanceolate - oblong, acute, dark green with a pale midrib, and pale green beneath. Panicle 10–12 in. long. Fl. an in. long, pale green, with a white lip veined with red on each side of a yellow disk, and having two horn-like processes at its base. Siam.

Alseuosmia macrophylla, A. Cunn. (*B. M.* t. 6951.) Caprifoliaceæ. G. shr. with alternate, elliptic-lanceolate, acute, serrate l., narrowed below into the petiole; and axillary clusters of drooping, sweetly-scented fl. 1½ in. long, with a cylindric tube widening at the mouth, and five spreading-fringed lobes, white, streaked with red. New Zealand.

Alsophila atrovirens, var. **Keriana,** Baker. (*G. C.* 1887, v. 1, p. 639.) Filices. S. Fern of ornamental character. Fronds bipinnate, oblong-lanceolate, 15–18 in. long, 6 in. broad; pinnæ lanceolate, 3–4 in. long, 1 in. broad; pinnules oblong, obtuse, crenate; sori placed midway between the midrib and margin. Stipes, 6–8 in. long, brown, muricated, without scales.

Alyxia bracteolosa, Rich. (*Gfl.* 1887, p. 71.) Apocyneæ. S. climber, with the l. in threes, oblong or sublanceolate, obtuse or acuminate, acute or rounded at the base. Cymes axillary many flowered, shortly pedunculate. Fl. hypocrateriform, with a long tube, pale yellow. Fiji.

Amaraboya amabilis, Linden. (*Ill. H.* v. 34, p. 27, pl. 9.) Melastomaceæ. G. A beautiful shr. with terete purplish stems ; large, opposite, elliptic, three-nerved l., and terminal umbels of large fl., pinkish-white, edged with carmine. New Granada.

Amaraboya princeps, Linden. (*Ill. H.* v. 34, p. 15, pl. 4.) S. on G. A magnificent shr., with square stems, large, elliptic, sessile, 3-nerved l., dark green above, purplish beneath, and terminal, few-flowered cymes, of very large, showy, bright carmine fl., with white stamens. New Granada.

Amaraboya splendida, Linden. (*Ill. H.* v. 34, p. 15, under A. princeps, and p. 94, pl. 34.) Somewhat similar to the above, but with larger carmine fl., which shades into rose and almost to white around the centre. New Granada.

Amasonia calycina, Hook. f. (*B. M.* t. 6915 ; *R. H.* 1887, p. 192.) Verbenaceæ. S. A handsome shr. with lanceolate, acuminate, toothed on sinuate l., and showy racemes of drooping, yellowish, tubular fl., with the calyx and the large leafy bracts bright crimson. British Guiana. Syn. *A. punicea* of gardens.

Andromachia Maroni, André (*R. H.* 1887, p. 496.) Compositæ. G. or H. H. herbaceous per. of ornamental character, about 2 ft. high, white-tomentose. L. petiolate, triangular-hastate, distantly toothed, 4–5 in. long, 3–4 in. broad. Heads corymbose, on long peduncles, radiate, pale yellow. Brazil.

Andromeda japonica, var. **elegantissima,** Carrière. (*R. H.* 1887, p. 83.) Ericaceæ. H. Garden variety.

Angræcum avicularium. (*G. C.* 1887, v. 1, p. 40.) Orchideæ. L. 4 in. long, 2½ in. broad, cuneate, oblong-elliptical 2-lobed. Fl. racemose, white; sep. and pet. lanceolate - cuspidate lip oblong, cuspidate, narrow at base; spur 4–5 in. long.; anther and rostellum resembling a bird's head.

Angræcum calligerum, Rchb. f. (*G. C.* 1887, v. 2, p. 552.) L. slightly glaucous, bilobed at apex. Fl. as large as those of A. Ellisii, with oblong, acute sep., having a semi-oblong tubercle on the base of the keel; cuneate-oblong acute pet.; and a pandurate acute lip, with a slender spur 6–7 times longer than the ovary.

Angræcum Grandidierianum, Carrière. (*R. H.* 1887, p. 42, f. 9.) A dwarf species with thick oblong l., obtuse and unequally two-lobed at the apex. The fl. are not described at the above place, but Reichenbach (*Flora* 1885, p. 381) describes the raceme as being 1–3 flowered; the sep. cuneate-oblong, acute; the pet. spathulate, apiculate; and the lip cordate pandurate or cordate-oblong, blunt, with a long filiform spur. The fl. are ivory white and about the same size of those of *A. Chailluanum.* Comoro Islands. Syn. *Aeranthus Grandidieranus,* Rchb. f.

Angræcum ichneumoneum, Lindl. (*G. C.* 1887, v. 2, p. 681.) L. oblong, a ft. long, by 2 ins. broad, unequally bilobed at the apex, shining dark green. Racemes long, lax. Bracts cup-shaped. Sep. and pet. oblong, subacute dirty ochreous-white. Spur much thickened at the apex. W. Tropical Africa. Syn. *Listrostachys ichneumonea.* Rchb. f.

Angræcum imbricatum, Lindl. (*G.C.* 1887, v. 1, p. 15.) A rather curious looking species, with a tall strong stem, leathery, cuneate-oblong, bluntly bilobed l., and clusterlike racemes of sweet-scented creamy-white fl., with orange and yellow lips. Sep. and pet. lanceolate. Lip flabellate, retuse, apiculate, convolute, spur recurved, blunt, not half as long as the blade of the lip, which it nearly touches.

Anguloa Ruckeri, var. **media,** Rchb. f. (*L.* v. 2, p. 13, pl. 53.) Orchideæ. A handsome var. with yellow fl. densely covered on the inside of the sep. and pet. with crimson spots and having a crimson lip. Columbia.

Anæctochilus Lansbergiæ, Linden. (*Ill. H.* v. 34, p. 7, pl. 1; *G.C.* 1887, v. 1, p. 421.) Orchideæ. S. terrestrial orchid. A very beautiful dwarf foliage plant, with broadly ovate acute l., the ground colour of which is of a dark velvetty green in the middle, reticulated with emerald green, shading into rich brown reticulated with old gold on the borders and edged with yellow. Fl. unknown. Malaya.

Ansellia confusa, N. E. Br. (*L.* v. 2, p. 36.) Orchideæ. This is the plant figured in the Botanical Register for 1846, t. 30, as *A. africana.* It differs from typical *A. africana* in having its pet. scarcely broader than the sep. W. Trop. Africa.

Anthurium acutum, N. E. Br. (*G. C.* 1887, v. 2, p. 776.) Aroideæ. S. per. A distinct-looking species about a ft. high, with slender petioles, and triangular hastate, exceedingly acute, dark green l. Peduncle 12–14 in. long, terete, spathe reflexed, 2–$2\frac{1}{4}$ in. long, $\frac{1}{3}$ in. broad, tapering to a subulate apex. Spadix subsessile $2\frac{3}{4}$–3 in. long, tapering, dull dark green. Brazil.

Anthurium Andreanum, var. **flore albo.** (*R. H.* 1887, p. 171.) Garden variety.

Anthurium brevilobum, N. E. Br. *G. C.* 1887, v. 1, p. 380,) S. A moderate-sized species with petioles 12–15 in. long, terete, acutely channelled down the face; and cordate-ovate blades 8–10 in. long, 4-5 in. broad, somewhat abruptly acuminate at apex, bright shining green. Peduncle 12–16 in. long. Spathe 2 in. long, $\frac{1}{3}$ in. broad, narrow lanceolate acuminate, purplish. Spadix dark purple-brown, slender, 3-4 in. long on a stalk $\frac{1}{8}$–$\frac{3}{8}$ in. long.

Anthurium punctatum, N. E. Br. (*G. C.* 1886, v. 26, p. 809.) S. per. in the way of *A. Harrisii* and *A. Bakeri.* Petioles 6–8 in. long, acutely channelled down the face, keeled or rounded on the back; blade 14–20 in. long, $2\frac{3}{4}$–$4\frac{1}{2}$ in. broad, elongate-oblong, somewhat abruptly acute, cuneate at base, bright dark green above, paler with blackish dots beneath. Peduncle 12–18 in. long, terete. Spathe spreading or reflexed, $3\frac{1}{2}$–$4\frac{1}{2}$ in. long, linear-oblong, cuspidate-acuminate, margins revolute, reddish above, green beneath, changing to greyish-green or purplish-green. Spadix 6–9 in. long, slightly tapering, olive-green. Ecuador.

Anthurium purpureum, N. E. Br. (*G. C.* 1887, v. 1, p. 575.) S. evergreen per. with ascending stem. Petioles 3–6 in. long, rounded on the back with a broad shallow channel down the face; the blade is 12–16 in. long, 3–$3\frac{3}{4}$ in. broad, oblong-lanceolate acute, cuneate-acute at base. Peduncle a ft. long. Spathe spreading or reflexed, $4\frac{1}{4}$ in. long, 1 in. broad, purple on both sides, with a green base. Spadix 6 in. long, slightly tapering, rich violet-purple. Brazil.

Anthurium Scherzerianum, var. **bruxellense,** Linden. (*Ill. H.* v. 34, p. 51, pl. 18.) S. Garden variety.

Anthurium Scherzerianum, var. **parisiense,** Carrière. (*R. H.* 1887, p. 144; *Ill. H.* v. 34, p. 47, pl. 16.) S. Garden variety.

Aphelandra chrysops, Bull. (*Bull Cat.* p. 9 and 7 with fig.; *G. C.* 1887, v. 1, p. 736, p. 140.) Acanthaceæ. S. This is the same as **A. squarrosa,** var. **Leopoldi,** Van Houtte.

Aquilegia flabellata, Carrière. (*R. H.* 1887, p. 548, f. 110.) Ranunculaceæ. H. per. Garden variety.

Ardisia capitata, A. Gr. (*Gfl.* 1887, p. 70.) Myrsineæ. S. shr. L. crowded at the apex of the thick branches, a ft. or more long, obovate-spathulate, entire, shortly stalked. Peduncles axillary, compressed, bearing a cone-like head of greenish-white fl., succeeded by bright red berries. Fiji.

Ardisia mamillata, Hance. (*G. C.* 1887, v. 2, p. 810, and 809, f. 154.) S. An ornamental plant of dwarf compact habit, hairy, l. shortly stalked, oblong, about 4 in. long, by 1½–2 in. broad, of a dark green, papillate above. Fl. white, tinged with rose, umbellate, on axillary peduncles 2 in long. Berries as large as a pea, brilliant rose-red. China.

Aristea platycaulis, Baker. (*G. C.* 1887, v. 1, p. 732.) Iridaceæ. G. per. A well-marked species, having a flat stem nearly as broad as the ensiform l., which grow to a ft. in length and an inch in breadth. Fl. in dense clusters, on short pedicels, blue. Pondoland.

Aristolochia hians, Willd. (*G. C.* 1887, v. 1, p. 40.) Aristolochiæ. S. climber, very similar to A. brasiliensis in foliage and form of fl., but the beak of the fl. is much longer than the broad reniform lobe, which is smaller than that of A. brasiliensis. Outside of fl. bronzy-green, with the veins and margin of beak yellowish-green; inside of the broad lobe dull yellowish-green, veined and spotted with purple-brown. Venezuela.

Aristolochia salpinx, Mast. (*G. C.* 1886, v. 26, p. 456 and 457, f. 92.) G. climber. L. cordate-ovate acuminate, glabrous 4–6 in. long, 2½–3 in. broad. Fl. about 1½ in. long, inflated at base, then abruptly constricted and bent upwards in the form of a dorsally compressed, trumpet-shaped tube, with an oblique mouth, outside cream-coloured, with purple network of veins, inside lighter, the upper lip with a yellow central blotch and numerous purplish spots around it; the margin is slightly reflexed, marked with purple lines and a few short purple hairs. Paraguay.

Asphodelus comosus, Baker. (*G. C.* 1887, v. 1, p. 799.) Liliaceæ. H. per., resembling *A. ramosus*, but differing in the long bracts, which protrude beyond the fl., and in the much exserted stamens. L. 1½ ft. long, 1½ in. broad ensiform, glaucous. Fl.-stem 2½ ft. high paniculately branched; fl. white with green keels to the segments. N. W. Himalaya.

Asplenium amboinense, Brackenridge. (*Williams' Cat.*, p. 20.) Filices. S. Fern with creeping stem clothed with black subulate scales and numerous evergreen lanceolate fronds, a ft. or more long, 1–1½ in. broad, narrowing below into a stipes of about 1 in. long, and with the apex truncate, having a scaly bud at the end of the midrib and a small forked or multifid continuation of the frond. South Sea Islands.

Asplenium scandens, J. Sm. (*G. C.* 1887, v. 1, p. 639.) S. A beautiful climbing fern, with sessile, lanceolate, decompound fronds, a ft. long, narrowed gradually from the middle to base and apex. Sumatra.

Aster angustus, Torr. and Gr. (*G. C.* 1886, v. 26, p. 659.) Compositæ. H. per. of little beauty, 1–2 ft. high, branching, with numerous spicately panicled heads, having the ray florets reduced to a rudimentary condition. N. America and N. Asia.

Aster pseudamellus, Hook. f. (*G. C.* 1886, v. 26, p. 659.) H. per. 6–18 in. high, allied to A. amellus, but with larger involucre bracts and toothed l.; stems rough, bearing a few corymbose heads 1–1¾ in. in diam., with bluish-purple rays. L. 1–2 in. long, oblong, acute or obtuse, entire or toothed, obscurely nerved. Involucre bracts with broad reflexed leafy tips. Western Himalayas, 8,000–13,000 ft.

Aster Stracheyi, Hook. f. (*B. M.* t. 6912; *G. C.* 1886, v. 26, p. 659; and *R. H.* 1887, p. 167, as *Acer Stracheyi.*) H. per of distinct character, suitable for rockwork. Very dwarf and stoloniferous, 1–4 in. high, pubescent or villous. Radical l. obovate-spathulate, toothed, stem-l. 1–2 in. long, sharply serrate. Stem, with 1 to few fl.-heads, an in. in diam. Involucre of a few narrow scales, scarcely imbricating. Ray, bluish-purple. Western Himalayas, 12,000–13,000 ft.

Aster tricephalus, Clarke. (*G. C.* 1886, v. 26, p. 686.) H. per 1–2½ ft. high, with leafy puberulous stems, bearing 1–3 large showy heads with purple rays. Radical l. obovate-spathulate on long winged petioles, entire, glabrous or hairy; stem l. oblong, half amplexicaul. Sikkim, 10,000–14,000 ft.

Athyrium filix-foemina, var. **acroclodon Wilsoni,** Woll. (*G. C.* 1887, v. 1, p. 185–6.) Filices. H. A variety which is stated to be intermediate between the varieties *rhæticum* and *crispum*, but no description is given. Scotland.

Azalia obtusa, var. **alba,** Veitch. (*Veitch Cat.*, p. 9.) Ericaceæ. G. shr. A var. with white fl. Japan.

Baeria gracilis, A. Gr. (*Gfl.* 1887, p. 392, f. 96.) Compositæ. H. annual 6–10 in. high, branching from the base, with opposite linear l. and solitary radiate heads of bright yellow fl., about $\frac{3}{4}$ in. in diam. California.

Bakeria vitiensis, Seem. (*Gfl.* 1887, p. 71.) Araliaceæ. S. A small tree with an unbranched stem. L. digitate, with 5–10 petiolate, elliptic-obovate leaflets with blunt points. Fl. in large compound umbels, green. Fiji.

Bambusa Castilloni, Marliac. (*R. H.* 1886, p. 513, f. 122.) Gramineæ. H. Bamboo with square stems, curiously variegated, one side of each internode being dark green and the other side yellow, these colours alternating in the next internode. L. also varegated. Japan.

Bambusa Weiseneri, Carrière. (*R. H.* 1887, p. 83.) Gramineæ. H. Bamboo. Garden variety, of Japanese origin.

Barleria repens, Nees. (*B. M.* t. 6954, *G. C.* 1887, v. 2, p. 341.) Acanthaceæ. S. A dwarf, prostrate, much-branched shrublet, with elliptic or obovate, obtuse l., 1–$2\frac{1}{4}$ in. long, narrowed into a petiole, and solitary axillary, deep rose-coloured fl., 1–$1\frac{1}{2}$ in. in diam., funnel-shaped, with 5 oblong spreading lobes. E. Trop. Africa.

Begonia cyclophylla, Hook. f. (*B. M.* t. 6926.) Begoniaceæ. G. A pretty and distinct-looking tuberous sp., with a solitary, orbicular-cordate, sparsely hairy, deep green l., having overlapping basal lobes, and pedunculate cymes of bright rose-pink fl. an in. in diam. South China.

Begonia egregia, N. E. Br. (*G. C.* 1887, v. 1, p. 346; *Bull Cat.*, p. 9.) S. An evergreen species with a tall-growing thick stem; peltate, obliquely-oblong, acuminate, bright green, thin l., which are rough from hair-bearing papillæ; and terminal drooping corymbose cymes of numerous white fl. $\frac{1}{2}$ in. in diam. Brazil.

Begonia Johnstoni, Oliver. (*B. M.* t. 6899, *R. H.* 1887, p. 45.) S. per., 1–$1\frac{1}{2}$ ft. high, glabrous, stems succulent, pale green spotted with red. L. on long petioles, obliquely cordate-ovate, acute, crenate, the basal lobes overlapping, dark green above, paler beneath. Cymes few-flowered, on long peduncles, fl. pale rose, the males about 1 in., the females about $\frac{1}{2}$ in. in diam. E. Trop. Africa.

Betula Medwediewi, Rgl. (*G. H.*, 1887, p. 383, f. 95, 1–4.) Cupuliferæ. H. tree with glabrous branches and elliptic-ovate, acutely-toothed glabrous l., with the midrib beneath and the petiole pubescent. Catkins cylindric, the males about $1\frac{1}{4}$ in. long, the females shorter. Transcaucasus.

Betula Raddeana, Trautz. (*Gfl.* 1887, p. 383, f. 95, 5–11.) H. tree, with the young shoots softly pubescent. L. small, ovate, acutely toothed, pubescent beneath on the nerves and in the angles of the nerves. Catkins ovoid-oblong, $\frac{3}{4}$–1 in. long. Caucasus.

Billbergia Gireoudiana, Kram. and Wittm. (*Gfl.* 1887, p. 330.) Bromeliaceæ. S. Epiphyte. Garden hybrid.

Bollea pulvinaris, Rchb. f. (*L.* v. 2, p. 29, pl. 61) Orchideæ. This does not appear to differ from **Zygopetalum cœleste,** Rchb. f.

Bougainvillea refulgens, Bull. (*Bull Cat.* p. 9.) Nyctagineæ. S. climber. A form with large brilliant purple-mauve bracts. Brazil.

Brahea nitida, André. (*R. H.* 1887, p. 344, f. 67–70.) Palmæ. H.H. palm with large fan-like, palmatifid, glaucous-green l.; and very large, much branched glabrous spadices. Fr. small, about the size of a pea, black. Mexico.

Briza rotundata, Steud. (*Gfl.* 1887, p. 638, f. 158.) Gramineæ. H. annual. An ornamental grass with erect narrow acute l., and narrow panicles of erect spikelets. Mexico, Brazil, and Chili.

Brodiæa Douglasii, Wats. (*B. M.* t 6907; *R. H.* 1887, p. 166.) Liliaceæ. Syn. *Triteleia grandiflora.*

Brunsvigia Massaiana, Linden and Rod. (*Ill. H.* v. 34, p. 55, pl. 19.) See *Crinum Massaiana.*

Bulbophyllum grandiflorum, Rchb. f. (*L.* v. 3, p. 27, pl. 108.) Orchideæ. A grotesque-looking plant, more remarkable than beautiful, with a creeping rhozome, bearing distant four-angled bulbs about 1 in. long, with one ellipitic l. about $2\frac{1}{2}$-3 in. long, by $1\frac{1}{2}$ in. broad, and very large solitary fl., densely reticulated with brown on a pale ground colour. Seps. lanceolate-attenuate, 4–5 in. long, free, the upper one twice as broad as the lateral sep., strongly arching over at the base and hanging down in front of the fl. New Guinea.

Burlingtonia caloplectron, Rchb. f. (*Williams' Cat.*, p. 21.) Orchideæ. A handsome species with small oblong two-edged bulbs, with solitary, thick, lanceolate l., and pendulous few-flowered racemes of rose-coloured fl., about the size of those of *B. fragrans*.

Calanthe Sanderiana, Williams. (*Williams' Cat.*, p. 21.) Orchideæ. A distinct spring-flowering species, with long, many-flowered racemes of deep rose-coloured fl., having a bright rosy-crimson lip, similar to that of *C. veratrifolia*, var. *Regnieri* in shape. Cochin China.

Calanthe veratrifolia, var. **Regnieri,** Rchb. f. (*G. C.* 1887, v. 2, p. 70.) A var. with white sep. and pet., and a light ochre lip, with diverging, nearly semilunate side lobes. Cochin China. Syn. *C. Regnieri* (*G. C.* 1887, v. 2, p. 108.)

Calceolaria Burbidgei. (*G. C.* 1886, v. 26, p. 464.) Scrophulariaceæ. G. Garden hybrid.

Calliandra tergemina, Benth. *G. C.* 1887, v. 2, p. 366.) Leguminosæ. S. shr. of ornamental character, with pinnate grey-green l., zig-zag branches, and globose heads of white fl., having the filaments tipped with red. Tropical America.

Campanula Wanneri, Rochel. (*Gfl.* 1887, p. 444, f. 112.) Campanulaceæ. H. alpine plant, about 6 in. high, pubescent. L. lanceolate acute, dentate, the lower ones stalked. Fl. from the axils of the stem l., pedunculate; calyx lobes lanceolate, acute; corolla blue, an in. long, erect, campanulate, with very short broad lobes. Banat.

Canarium vitiense, A. Gr. (*Gfl.* 1887, p. 71.) Burseraceæ. S. A small tree with pinnate l., having 5–7 oblong-elliptic, obtuse leaflets, and panicles of small yellowish-white fl., succeeded by bluish-black fruit. Fiji.

Caragana pendula, Carrière. (*R. H.* 1887, p. 298.) Leguminosæ. H. shr. Garden variety of **C. arborescens.**

Caraguata Morreniana, André. (*R. H.* 1887, p. 12, with pl. *G. C.* 1887, v. 1, p. 251.) Bromeliaceæ. S. epiphyte. A handsome plant, with a large rosette of l. 16–20 in. long, by 2 in. broad, with recurved acuminate tips; the outer ones dark green, gradually passing, by being shaded and tinted with violaceous, into the violaceous floral l. Fl.-stem 4–6 in. long, bearing a large compact head of yellow fl., with bright red bracts. Rio Cuaiquer, New Granada.

Carex scaposa, Clarke. (*B. M.* t. 6940; *G. C.* 1887, v. 2, p. 108.) Cyperaceæ. G. or S. A remarkable and ornamental Sedge, with broad, lanceolate, acute l., narrowed into a petiole at the base, and erect, loose panicles of brownish-red spikelets. South China.

Carmichælia Mulleriana, Rgl. (*Gfl.* 1887, p. 611.) Leguminosæ. G. shr., about 2 ft. high. Branches slender, compressed, pinnately branched, the branchlets filiform, compressed. L., with 1–3 small, obvate, emarginate leaflets, about ½ in. long, on a rather longer petiole. Fl. solitary or in pairs in the axils of the l., small, whitish, striate with purple. New Zealand?

Catalpa syringæ, var. **foliis argenteis,** Lovyman. (*R. H.* 1887, p. 64.) Bignoniaceæ. H. tree. L. variegated. Garden variety.

Catasetum Bungerothi, var. **aureum,** Linden (*L.* v. 3, p. 43, pl. 116.) Orchideæ. A distinct var., with light yellow fl. Venezuela.

—— Var. **Pottsianum,** Linden. (*L.* v. 3, p. 19, pl. 104; *G. C.* 1887, v. 2, p. 341.) A var. having the pet. prettily spotted with purple, and with a few spots on the centre of the lips.

Catasetum costatum, Rchb. f. (*G. C.* 1887, v. 1, p. 72.) A curious species with yellowish sep. and pet. Lip with erect triangular side lobes, ciliate on the upper border, mid lobe lower, extending into a low blunt triangle, standing over the long blunt cone, obscurely ribbed, mouth contracted.

Catasetum cristatum, var. **stenosepalum,** Rchb. f. (*Ill. H.* v. 34, p. 71, pl. 25.) A var. with narrow linear-lanceolate purple-brown sep., and rather shorter dull purple pet. striata with blackish-purple. Lip green, fringed, having a triangular basal-fringed crest.

Catasetum fimbriatum, var. **viridulum,** Rchb. f. (*G. C.* 1827, v. 2, p. 272.) A var. with green fl. spotted with reddish-purple, and having a depressed crest on the lip.

Catasetum galeritum, Rchb. f. (*L.*, v. 2, p. 41, pl. 67; *G. C.* 1886, v. 26 p. 616.) A fine species allied to *C. atratum*, with a several-flowered lax raceme of rather large fl. Sep. and pet. oblong, acute, pale green, spotted with brown. Lip saccate, oblong, conical at the apex, pale green, ochreous in front, marked with brown around the mouth, and marked with brown on a yellow ground inside. Columbia?

Catasetum pileatum, Rchb. f. (*G. C.* 1886, v. 26, p. 616.) A fine species with rather large white fl. Sep. narrow oblong, acute, petals broadly oblong, acute. Lip large, broadly triangular, with a bluntly conical spur. Column, with a very long beak.

Catasetum sanguineum, var. **integrale,** Rchb. f. (*G. C.* 1887, v. 2, p. 214). A trifling var. with an entire lip.

Catasetum trulla, var. **subimberbe**, Rchb. f. (*G. C.* 1887, v. 2, p. 552.) A var. without a fringe of hairs to the lip.

Cattleya Bullieri, Carrière. (*R. H.* 1886, p. 444, with pl.) Orchideæ. This is a trifling form of **C. labiata**, var. **Trianæ**, Duchartre.

Cattleya calummata, Bleu. (*G. C.* 1886, v. 26, p. 524, f. 104; *Gfl.* 1887, p. 88, f. 31.) Garden hybrid.

Cattleya Dukeana, Rchb. f. (*G. C.* 1887, v. 1, p. 576.) Bulbs about 2 ft. high. L. 5 ins. long, 2½ ins. broad, purplish-green. Sep. shining, light ochre outside; the upper one washed with dull mauve-purple inside, with a green apex; the lateral ones bent at an angle, mauve-purple on basal part, brownish on apical part. Pet. broader, wavy, mauve-purple on the disk, lighter on the borders. Lip with the side lobes not quite covering the column, white with light purple margins, front lobe broadly stalked, reniform, toothed, and covered with warts, mauve-purple with a narrow white border, the disk between the side lobes is sulphur-yellow with six mauve keels.

Cattleya granulosa, var. **asperata**, Rchb. f. (*G. C.* 1886, v. 26, p. 681.) A fine variety with brownish sep. and pet. spotted with dark purple. Lip yellowish at base, light vivid purple with a broad white border in front, rough on the surface.

—— Var. **Schofieldiana**, Veitch. (*Veitch Man. Cattl. and Lælia*, p. 36.) Syn. *C. Schofieldiana*, Rchb. f.

Cattleya Harrisii, Rchb. f. (*G. C.* 1887, v. 1, p. 104, *Veitch Man. Cattl. and Lælia*, p. 91.) Garden hybrid.

Cattleya Kimballiana, Linden and Rodigas. (*L.* v. 2, p. 85, pl. 89; *G. C.* 1887, v. 2, p. 108.) A fine handsome species with large fl., the lanceolate acute sep., and very broad elliptic wavy pet. of a delicate rosy white, the tube of the lip is white outside with some yellow near the front margins, the inside is yellow with orange lines, and the wavy front lobe is rich purple on the front part. Venezuela.

Cattleya labiata. The following are now given as varieties of this in *Veitch. Man. Cattl. and Lælia* at the page given after the name of each var.

—— Var. **alba**, Veitch. p. 19. Syn. *C. alba.*

—— Var. **autumnalis**, Linden. (*L.* v. 3, p. 35, pl. 112.) A fine autumn-flowering form with bright rose-purple fl., having a white blotch on each side of the mouth of the tube of the lip, and a large wedge-shaped dark purple blotch on the front part.

Cattleya labiata—*cont.*

—— Var. **brilliantissima**, Veitch, p. 19. Syn. *C. brilliantissima*, of gardens.

—— Var. **chocoensis**, Veitch, p. 25. Syn. *C. chocoensis*, Lind. and André.

—— Var. **crocata**, Veitch, p. 17. Syn. *C. crocata*, Rchb. f.

—— Var. **delicata**, Veitch, p. 25. Syn. *C. Warscewiczii* var. *delicata*, Moore and *C. Rollissonii*, Moore.

—— Var. **Dowiana**, Veitch, p. 16. Syn. *C. Dowiana*, Batem.

—— Var. **Eldorado**, Veitch, p. 17. Syn. *C. Eldorado*, Linden.

—— Var. **ornata**, Veitch, p. 17. Syn. *C. Eldorado*, var. *ornata*, Rchb. f.

—— Var. **regina**, Veitch, p. 19. Syn. *C. speciosissima* var. *reginæ*, Rchb. f.

—— Var. **splendens**, Veitch, p. 17. Syn. *C. Eldorado* var. *splendens*, Linden.

—— Var. **virginalis**, Veitch, p. 17 and 25. Syn. *C. virginalis*, Lind. and André, and *C. Wallisii*, Linden.

—— Var. **Warneri**, Veitch, p. 27. Syn. *C. Warneri*, T. Moore.

—— Var. **Wilsoniana**, Rchb, f. (*G. C.* 1887, v. 2, p. 460.) A var. with amethyst coloured sep., pet., and front lobe of lip, which latter is marked and spotted with dark purple, and has on each side a dark purple area; at the base are some delicate lines on a pale ground, and in the centre are some oblique dark purple lines and a light yellow eye on each side.

Cattleya Lawrenceana, var. **oculata**, Veitch. (*Veitch. Man. Cattl. and Lælia*, p. 41.) A var. with the central area of the lip buff-yellow, and without a purple band.

—— Var. **rosea-superba**, Veitch. (*Veitch. Man. Cattl. and Lælia*, p. 41.) A robust var. with large delicate rosy-purple fl., striated with white, the sep. paler than the pet. and lip, which has a white disk.

Cattleya Loddigesii, var. **Harrisoniæ**, Veitch. (*Veitch Man. Cattl. and Lælia*, p. 42.) Syn. *C. Harrisonæ*, Lindl.

—— Var. **candida**, Veitch. (*Veitch Man. Cattl. and Lælia*, p. 42.) Has white fl. with a yellow disk to the lip.

—— Var. **maculata**, Veitch. (*Veitch Man. Cattl. and Lælia*, p. 42.) A var. having the fl. dotted with purple.

—— Var. **violacea**, Veitch. (*Veitch Man. Cattl. and Lælia*, p. 42. Has the fl. more deeply coloured than the typical form.

Cattleya maxima, var. **alba**, Veitch. (*Veitch Man. Cattl. and Lælia*, p. 44.) A form with white fl., having the usual yellow and purple markings on the lip.

Cattleya Measuresii, Rchb. f. (*G. C.* 1886, v. 26, p. 526; *Veitch Man. Cattl. and Lælia*, p. 86.) Garden hybrid.

Cattleya Mossiæ aurea grandiflora. (*G. C.* 1887, v. 2, p. 219.) Garden variety.

Cattleya porphyroglossa, var. **punctulata,** Rchb. f. (*G. C.* 1887, v. 2, p. 98.) A var. having the sep. and pet. marked with crimson spots.

Cattleya Schilleriana, var. **Amaliana,** Linden. (*L.* v. 2, p. 81, pl. 87; *G. C.* 1887, v. 2, p. 108.) A handsome form with a very large broad front lobe to the lip, which is densely veined with bright purple on a white ground, and has a yellow disk. Brazil.

Cattleya Skinneri, var. **oculata,** Veitch. (*Veitch. Man. Cattl. and Lælia*, p. 46.) A var. with a large maroon-purple blotch on the lip.

Cattleya sororia, Rchb. f. (*G. C.* 1887, v. 1, p. 40. *Veitch Man. Cattl. and Lælia*, p. 87; *W. O. A.* v. 7, pl. 307.) Something in the way of *C. Harrisoniæ* with greenish-yellow tips to the sep., the pet. are marked with numerous dark spots, the lip is white with light purple margins, and a few dark purple lines at the base, and some purple spots on the stalk. The front lobe of the lip is triangular, retuse emarginate, with some asperities on the disk. Brazil.

Cattleya speciosissima, var. **Buchananiana,** Williams and Moore. (*W. O. A.* v. 6, pl. 261; *G. C.* 1887, v. 1. p. 46.) This is a var. of **C. labiata,** with large fl. of a delicate rosy lilac, the front part of the lip being rich magenta, with a magenta stripe along the centre of the disk, and the mouth of the tube marked with light yellow. Venezuela.

Cattleya suavior, Rchb. f. (*Veitch Man. Cattl. and Lælia*, p. 92.) Garden hybrid.

Cattleya Trianæ, var. **Hooleana,** Williams (*W. O. A.* v. 6, pl. 265.) A form of **C. labiata,** var. **Trianæ,** with the entire lip of rich magenta-purple, marked with two curved clavate orange-yellow spots in the throat. New Granada.

Cattleya Schroederæ, Rchb. f. (*G. C.* 1887, v. 1, p. 512.) A fine form of **C. labiata,** var. **Trianæ,** nicely scented, with crisped pet. and lip, the general colour being light purple, with an orange area on the lip.

Cattleya virginalis, Lind. and André. (*L.* v. 3. p. 13, pl. 101.) A large white-flowered sp., with the disk and tube of the lip yellow. The sep. are lanceolate acute; pet. broad, elliptic obtuse; lip tubular, entire with a frilled front lobe.

Cattleya Walkeriana. The following are now placed as varieties of this species by Mr. Veitch in his *Manual of Cattleya and Lælia*, p. 50.

—— Var. **dolosa,** Veitch. Syn. *C. dolosa*, Rchb. f.

—— Var. **nobilior,** Veitch. Syn. *C. nobilior*, Rchb. f.

—— Var. **Schroederiana,** Veitch. Syn. *C. Schroederiana*, Rechb. f.

Cattleya Zenobia, Rolfe. (*G. C.* 1887, v. 2, p. 552.) Garden hybrid.

Cecropia dealbata, Williams. (*Williams' Cat.*, p. 21.) Artocarpeæ. S. A fine Snake-wood tree of ornamental character, with large, soft, pubescent, palmate l., light green above, glaucous beneath. New Granada.

Cerasus acida, var. **pyramidalis,** Carrière and André. (*R. H.* 1886, p. 460.) Rosaceæ. H. tree. A garden variety of the Montmorency Cherry, with erect branches, forming a pyramidal growth resembling that of the Lombardy Poplar.

Ceratotheca triloba, E. Mey. (*G. C.* 1887, v. 2, p. 492–3, f. 99.) Pedalineæ. G. or H. H. annual. An exceedingly beautiful herb of tall habit, with opposite stalked l., the lower ones large and 3-lobed, the uppermost smaller, cordate or ovate-lanceolate, lobed and toothed. Fl. large, deflexed, in long racemes, tubular with an oblique limb, the lower lobe longer than the rest, ovate, and not spreading as the rest are, the colour is of a delicate mauve, whitish inside, the lower lobe marked with purple lines. Natal.

Ceropegia Montiroæ, Hook. f. (*B. M.* t. 6927.) Asclepiadaceæ. S. succulent climber, remarkable for its singular fl. Stem rough. L. 1–2 in. long, lanceolate, bluntly pointed, wavy. Cymes 3-flowered, axillary. Fl. 2 in. long, trumpet-shaped, with a dome-like canopy over the mouth, the colour is white and green, spotted with purple-brown, and fringed with purple hairs. Delagoa Bay.

Chamæcerasus Alberti, Späth. (*R. H.* 1886, p. 547.) Caprifoliaceæ. H. shr. A species of **Lonicera** with slender branches, soft linear l., somewhat like those of the Rosemary, of a greyish-green, glaucous beneath, and rose-coloured fl.

Chamæcerasus alpigena, var. **nana,** Carrière. (*R. H.* 1887, p. 63.) Rosaceæ. H. shr. Garden variety of **Lonicera alpigena.**

Chrysanthemum Decaisneanum, N.E Br. Compositæ. H. late-flowering per. 1–1½ ft. high, similar to C. marginatum in appearance, with obovate pinnatifid l., and larger, radiate, pale yellow heads. Japan. Syn. *Pyrethrum Decaisneanum*, Maxim.

Chrysanthemum marginatum, N. E. Br. H. late-flowering per., with tomentose stems, cuneate-oblong l., pinnatifid in the upper third, tomentose beneath and on the edge, and rounded corymbs of small dark yellow heads. Japan. Syn. *Pyrethrum marginatum*, Miq.

Chrysanthemum multicaule, Desf. (*B. M.* t. 6930.) H. annual ½–1 ft. high, branching, with smooth, glaucous, l. and stems. L. fleshy, linear-spathulate, and coarsely pinnatifid, 1–3 in. long, ½–¾ in. broad, or smaller and trisect or pinnatisect with narrow segments. H. solitary on long peduncles, radiate, bright yellow 1½–2½ in. in diameter. Algeria.

Cirrhopetalum Lendyanum, Rchb. f. (*G. C.* 1887, v. 2, p. 71.) Orchideæ. A pretty little species, with pear-shaped, 4-angled, reddish bulbs, cuneate-oblong acute l., and wiry peduncle, bearing an umbel of small whitish fl., with a greenish-yellow hue. Upper sep. oblong acuminate, lateral sep. linear-acuminate, free, twice as long as upper sep. Pet. oblong acuminate, nearly as long as upper sep. Lip compressed, triangular as seen from the side, two-keeled. Syn. *Bulbophyllum Lendyanum*, Rchb. f.

Cirrhopetalum stragularium, Rchb. f. (*G. C.* 1887, v. 2, p. 186.) Allied to *C. Thouarsii*, with the upper sep. elliptic, cucullate, with a short apical bristle, purple at the apex and dotted with purple; lateral sep. connate, pale yellow blotched and dotted with purple; pet. bristly on the border, and warted towards the apex, yellowish, spotted with purple, and having brownish purple tips; lip curved with two diverging angles near the base, convolute, covered with purple-black spots. Syn. *Bulbophyllum stragularium*, Rchb. f.

Claviga Ernstii, Hook. f. (*B. M.* t. 6928.) Myrsineæ. S. shr., growing to 4–5 ft. high, but flowering when much smaller. Stem very robust. L. clustered at the ends of the branches, petiolate, 12–16 in. long, 4–6 in. broad, leathery, oblong or elliptic-oblong, acutish, dark green above, yellow-green beneath. Racemes numerous, axillary, many-flowered, drooping. Fl. ½ in. in diam., apricot-yellow. Caracas.

Clematis rhodochlora, André. (*R. H.* 1887, p. 449.) Ranunculaceæ. Garden variety.

Clerodendron Rumphianum, Bull. (*Bull Cat.*, p. 9.) Verbenaceæ. S. A handsome shr. with large, roundish-ovate, dark green l., and terminal panicles of long-tubed fl., which at first are flesh-coloured, deepening to red and crimson; stamens exserted, red. Java.

Coelogyne Hookeriana, var. **brachyglossa,** Rchb. f. (*G. C.*, 1887, v. 1, p. 833.) Orchideæ. A variety with pale rose and pet., and a more open white lip, sep. having the disk light yellow spotted with reddish-brown. Himalayas.

Coelogyne maculata, var. **virginea,** Rchb. f. (*G. C.*, 1887, v. 2, p. 682.) A var. with pale green bulbs, and the lip tinted with light sulphur, without spots.

Coelogyne Sanderiana, Rchb. f. (*G. C.* 1887, v. 1, p. 764.) A fine species with white fl., the front lobe of the lip being yellow and the side lobes marked with 3 brown stripes. Bulbs over 2 ins. long. L. a ft. long, 2½ ins. wide, petiole dilated at base. Raceme 5–6-flowered. Fl. as large as those of *C. speciosa.* Sunda Isles.

Colchicum Troodii, Kotschy. (*B. M.* 6901, *R. H.* 1887, p. 166.) Liliaceæ. H. An autumn-flowering species, the depressed-globose corm, producing numerous white fl. 1½ ins. in diam., with narrow oblong segments. L. appearing in spring, 6–12 ins. long, ⅔–1 in. broad, strap-shaped, obtuse, dark green. Cyprus.

Corypha decora, Bull. (*Bull Cat.* p. 10.) Palmæ. S. An ornamental palm with fan-shaped l., divided almost to the base into linear segments ½ in. broad. Petioles armed with hooked prickles. Queensland.

Costus mosaicus, Bull. (*Bull Cat.* p. 10.) Scitamineæ. S. per. with variegated foliage. L. obliquely lanceolate, 3–4 ins. long, the centre dark green, the rest tessellated with silvery-grey. Congo.

Crassula rhomboidea, N. E. Br. (*G. C.* 1886, v. 26, p. 712.) Crassulaceæ. G. succulent of botanical interest, 2–3 ins. high, glabrous. L. rhomboidal, hunched above the middle, subacute, ¾–1 in. long, ½–3 in. broad, ¼–½ in. thick, glaucous, punctate-dotted. Fl. in short-stalked, terminal, few-flowered cymes, pale flesh-coloured. Transvaal.

Cratægus pinnatifida, var. **major,** N. E. Br. (*G. C.* 1886, v. 26, p. 621, f. 121.) Rosaceæ. H. tree. An ornamental form, with long-stalked, lobed, and pinnatifid l., and corymbs of large-sized white fl., succeeded by large pear-shaped fr., ¾-in. in diam., of a fine bright red. North China.

Crinum crassipes, Baker. (*G. C.* 1887, v. 2, p. 126.) Amaryllidaceæ. S. Bulb very large, conical. L. lorate, suberect, 4 ins. broad, bright green. Scape compressed, less than 1 ft. long, ¾ in. thick.

Fl. 15–20 in. an umbel, tube 3 ins. long, limb suberect, 2½ ins. long, the segments ½ in. broad, white, with a pink keel. Stamens with claret-purple filaments.

Crinum longifolium, var. **Farinianum,** Baker. (*G. C.* 1887, v. 1, p 833.) S. Bulb narrow, with a long neck. L. 3–4 ft. long, 2 ins. broad, glaucous. Scape from the side of the bulb, 2 ft. long, bearing 5–6 fl. on pedicles 1–2 ins. long; fl.-tube 3½–4 ins. long, fl. about 3 ins. in diam., funnel-shaped, white with a pink median stripe on the segments when first expanded, afterwards fading to pink, and the segments closing together; the tube is curved and about 3½–4 ins. long. Kalahari Desert.

N.B.—Mr. Baker described the fl. as pink with permanently connivent segments, but he only saw faded flowers; the white colour of the fl. when first open only lasts for about a day. Kalahari Desert.

Crinum Massaiana, N. E. Br. A fine species, allied to *C. Kirkii*, with a very elongated bulb about 18 ins. long, and long broad l. The fl.-stem is about 2½ ft. high, and bears a large many-flowered umbel of large white fl., having a red stripe down the centre of each segment. Zanzibar. Syn. *Brunsvigia Massaiana*. Lind. and Rod. in *Ill. H.* v. 34, p. 55, pl. 19.

Crinum vanillodorum, Welw. (*Ill. H.* v. 33, p. 185, pl. 617.) S. bulb, a handsome species, with a long-necked bulb, lanceolate l. 16–20 ins. long, by 2–3 ins. broad, and a lateral scape overtopping the l., bearing an umbel of 5–6 long-tubed, white fl. with broad and rather spreading segments. Congo, Angola.

Croton Newmanii, Bull. (*Bull. Cat.*, pp. 10 and 6, with fig.) Euphorbiaceæ. S. A form of **Codiæum variegatum,** with lanceolate l., variegated with yellow and whitish on a bright green ground, the variegation forming a broad central stripe. Polynesia.

Cryptophoranthus maculatus, Rolfe. (*G. C.* 1887, v. 2, p. 693.) Orchideæ. *See* **Pleurothallis maculatus.**

Cypripedium album, Rchb. f. (*G. C.* 1887, v. 1, p. 512.) Orchideæ. Garden hybrid.

Cypripedium amandum, Rchb. f. (*G. C.* 1887, v. 1, p. 174; *Bull. Cat.*, p. 10.) Garden hybrid.

Cypripedium Amesianum, Williams. (*Williams' Cat.*, p. 22.) Garden hybrid.

Cypripedium concinnum, Bull. (*Bull Cat.*, p. 10.) Garden hybrid.

Cypripedium concolor, var. **tonkinense,** Linden. (*L.* v. 2, p. 61, pl. 77; *G. C.* 1887, v. 1, p. 486.) This is a two-flowered form with rather larger fl. Tonkin. Syn. *C. tonkinense*, Linden.

Cypripedium delicatulum, Rchb. f. (*G. C.* 1887, v. 2, p. 552.) Garden hybrid.

Cypripedium doliare, Rchb. f. (*G. C.* 1887, v. 1, p. 447.) Garden hybrid.

Cypripedium Hornianum, Rchb. f. (*G. C.* 1887, v. 2, p. 428.) Garden hybrid.

Cypripedium insigne, var. **Mooreanum,** Williams. (*Williams' Cat.*, p. 22.) Garden variety.

Cypripedium Laurenceanum, var. **coloratum.** Rchb. f. (*G. C.*, 1887, v. 2, p. 272.) A trifling form with a more acute upper sep., tinted with light mauve between the veins, and with numerous warts on the pet.

—— Var. **stenosemium,** Rchb. f. (*G. C.* 1887, v. 2, p. 38.) A slight variety with a narrower upper sep. than in the typical form.

Cypripedium lineolare, Rchb. f. (*G. C.* 1887, v. 1, p. 447.) Garden hybrid.

Cypripedium Measuresianum, Williams. (*Williams' Cat.*, p. 22; *W. O. A.* v. 7, pl. 304.) Garden hybrid.

Cypripedium obscurum, Rchb. f. (*G. C.* 1887, v. 1, p. 8.) Garden hybrid.

Cypripedium orbum, Rchb. f. (*G. C.* 1887, v. 2, p. 778.) Garden hybrid.

Cypripedium pleistochlorum, Rchb. f. (*G. C.* 1887. v. 2, p. 552.) Garden hybrid.

Cypripedium[1] **plunerum,** Rchb. f. (*G. C.* 1887, v. 1, p. 40.) Garden hybrid.

Cypripedium præstans, Rchb. f. (*G. C.* 1886, v. 26, p. 776; and 1887, v. 2, p. 243, p. 813, p. 155, and p. 814; *Ill. H.* v. 34, pp. 35 and 73, pl. 26.) A fine species, in the way of *C. philippinense*, having similar l., and a several flowered hairy peduncle. Fl. large, sep. nearly equal, the lower one broadest, striped with dark brown, the 3 median nerves keeled outside. Pet. narrow, twisted, wavy at base, tapering towards apex, hairy on the margins at the base, yellowish with reddish brown nerves at the base, and dark brown spots on the margin. Lip similar to that of C. Stonei, with a very long basal part, yellowish. New Guinea.

Cypripedium regale, Bull. (*Bull Cat.* p. 10.) Garden hybrid.

Cypripedium Saundersianum, Rchb. f. (*G. C.* 1886, v. 26, p. 654.) Garden hybrid.

Cypripedium Schroderæ, var. **splendens,** Linden. (*L.* v. 2, p. 45, pl. 69.) Garden hybrid.

Cypripedium Tautzianum, Rchb. f. (*G. C.* 1886, v. 26, p. 681; *Gfl.* 1887, p. 286.) Garden hybrid.

Cyrtandra Pritchardii, Seem. (*Gfl.* 1887, p. 130.) Gesneraceæ. S. A glabrous shr. with petiolate, elliptic, obtusely-toothed l., acute at both ends, 5–6 in. long, by 2–2½ in. broad, and pedunculate, axillary, 3-flowered cymes of small white fl., succeeded by ovoid white berries. Fiji.

Cytisus filifer, Besson. (*R. H.* 1886, p. 547.) Leguminosæ. H. shr. Said to be a form of **Genista sibirica,** with numerous pale yellow fl.

Dasylirion quadrangulatum, Wats. (*Gfl.* 1887, p. 280, f. 75.) Liliaceæ. G. on S. Stem stout, about 3 ft. high, crowned with a dense tuft of slender quadrangular l., about 2 ft. long. Fl. stem about 5 ft. high, with a dense spike-like panicle of small fl. Texas.

Davallia ferruginea, Desv. (*G. C.* 1887, v. 1, p. 639.) Filices. S. A large sarmentose species, with decompound fronds, having small, sessile, crowded, cuneate ultimate segments. Madagascar.

Delphinium Zalil, Aitch & Hemsl. (*G. C.* 1887, v. 2, p. 558.) Ranunculaceæ. H. annual of attractive appearance, with branching stem, finely cut dark green l., and long racemes of pale yellow fl. Afghanistan.

Dendrobium aurantiacum, Rchb. f. (*G. C.* 1887, v. 2, p. 98.) Orchideæ. Allied to *D. clavatum*, but having long bracts and broader sep. and pet. Stems slender, a ft. or more long. L. linear, 2–3 in. long, ¼ in. broad. Racemes short, 1–3 flowered, fl. uniform orange. Sep. oblong, pet. broader, lip "hastate semi-ovate," rough inside, with some linear elevations at base. Assam.

Dendrobium bracteosum, Rchb. f. (*G. C.* 1886, v. 26, p. 809; *L.* v. 2, p. 55, pl. 74.) An interesting and attractive species allied to *D. cumulatum*, remarkable for the bracts being nearly as long as the fl., which are grouped in capitate masses, and are purple with yellow lips, marked with reddish on the front margins. Sep. triangular-keeled, the spur about ⅗ the length of the free parts of the lateral sep., rather blunt. Pet. narrower, oblong acute. Lip nearly spathulate, a little convex on the upper sides, much thicker at the base. New Guinea.

Dendrobium chlorostele, Rchb. f. (*G. C.* 1887, v. 1, p. 477.) Garden hybrid.

Dendrobium chrysodiscus, Rchb. f. (*G. C.* 1887, v. 1, p. 414.) Garden hybrid.

Dendrobium cybele, Rolfe. (*G. C.* 1887, v. 2, p. 778.) Garden hybrid.

Dendrobium Falconeri, var. **giganteum,** Williams. (*W. O. A.* v. 6, pl. 257.) A robust var. with large blush-white fl. tipped with rosy-purple on the sep. pet. and lip, the base of the lip with two large maroon-purple blotches bordered with orange-yellow. North India.

Dendrobium Friedricksianum, Rchb. f. (*G. C.* 1887, v. 2, p. 648.) Allied to *D. signatum*. Stems rather thick, furrowed, spotted with purple on the sheaths. Racemes few flowered. Fl. light yellow, the lip with a darker yellow centre marked with a dark purple blotch; in form the lip is oblong subacute, rough on the disk, with a clavate raised line at the base, which is tomentose at its apex. Siam.

Dendrobium Fytchianum, var. **rosea,** Berkeley. (*G. C.* 1887, v. 1, p. 209; *Williams Cat.*, p. 22.) A variety with rose-coloured sep. and pet., and the side lobes and base of front lobe of lip deep crimson-purple. Burmah.

Dendrobium hercoglossum, Rchb. f. (*G. C.* 1886, v. 26, p. 487.) A pretty species allied to *D. aduncum*, with slender stems having lateral racemes at the top. Fl. similar to those of *D. aduncum*, but the spur more oblique; sep. and pet. delicate mauve; lip white with a mauve-purple recurved apex, the basal part is cup-shaped, hairy inside, and separated from the front part by a transverse fringe of hairs. Malacca.

Dendrobium inauditum, Rchb. f. (*L.* v. 2, p. 39, pl. 66; *G. C.* 1886, v. 26, p. 552; and 1887, v. 1, p. 45.) A very singular species, with tufted, fusiform-ovate, green bulbs, that are narrowed at the apex into a slender brownish leaf stalk 3–4 in. long, bearing an elliptic obtuse l, from the base of which arise two fl., after the manner of a Pleurothallis. Pedicel, including the ovary, about 2 in. long. Sep. and pet. 1½ in. long, narrow linear-lanceolate, pale yellowish. Lip with square, obtuse-angled side lobes, and a lanceolate acuminate front lobe, pale ochreous spotted with brown. New Guinea.

Dendrobium Loddigesii, Rolfe. (*G. C.* 1887, v. 2, p. 155; *G. C.* 1887, v. 2, p. 786.) This is the plant incorrectly named *D. pulchellum* in gardens.

Dendrobium melanodiscus, Rchb. f. (*G. C.* 1887, v. 1, p. 414.) Garden hybrid.

Dendrobium nycteridoglossum, Rchb. f. (*G. C.* 1886, v. 26, p. 616.) A small-flowered species with the habit of *D. serra.* Fl. produced in fascicles on the upper and ultimately leafless part of the stem, green, striped, with very dark red on the sep. and pet., and with a dark green spot on the disk of the lip, which has broad triangular side lobes, and very short retuse central lobe. Papua.

Dendrobium polyphlebium, Rchb. f. (*G. C.* 1887, v. 1, p. 702; *W. O. A.* v. 7, pl. 229.) A pretty species, with the habit and fl. of *D. Pierardi,* but the sep. and pet. are broader, of a bright rosy colour; lip rounded, slightly fringed and hairy, the basal part pale, with three keels and numerous radiating purple veins, the disk rich purple, and the margin whitish or pale yellow. Burmah.

Var. **Emerici,** Rchb. f. (*G. C.* 1887, v. 2, p. 242.) A brightly coloured var. with a white mid-line outside the lateral sep., the dark blotch on the front of the lip is interrupted by an amethyst-coloured bar, and the front margin is white, changing to straw colour. Birma.

Dendrobium purpureum, var. **candidulum,** Rchb. f. (*G. C.* 1887, v. 2, p. 70; *L.* v. 3, p. 7, pl. 98.) A var. with white fl., tipped with green on the sep.

Dendrobium rutriferum, Rchb. f. *G. C.* 1887, v. 2, p. 746.) Stems slender furrowed. Fl. in short capitate racemes, rose-coloured, about the size of those of *D. secundum.* Sep. triangular obtuse. Pet. spathulate obtuse. Lip oblong-pandurate, with inflexed borders, saccate and denticulate at the apex, and having a transverse, emarginate, linear crest in front of the base. New Guinea.

Dendrobium Schneiderianum, Rchb. f. (*G. C.* 1887, v. 1, p. 209.) Garden hybrid.

Dendrobium splendidissimum, var. **grandiflorum,** Veitch. (*Veitch. Cat.*, p. 10.) Garden hybrid.

Dendrobium sulcatum, var. **polyantha,** Rolfe. (*G. C.* 1887, v. 1., p. 607.) This is merely the properly developed condition of the plant, the original description and figure given by Lindley being from a poor specimen.

Dendrobium trigonopus, Rchb. f. (*G. C.* 1887, v. 2, p. 682.) Bulbs fusiform, sulcate, 6–7 ins. long, 1–3 leaved. L. oblong acute, 3–4 ins. long, thin, hairy on the back, and when young on both sides. Fl., solitary (always ?), golden yellow; ovary, 3-angled; sep., oblong, acuminate keeled; pet. broader and shorter; lip with a rather long claw, and a broad toothletted limb, which has nearly square side lobes, the disk is marked with transverse red lines on each side, and the front lobe has a green central area. Birmah.

Dendrobium Vannerianum, Rchb. f. (*G. C.* 1887, v. 2, p. 72.) Garden hybrid.

Dimorphotheca fruticosa, D.C. (*G.C.* 1887, v. 2, p. 398.) Compositæ. H. H. per. or annual ? with procumbent stems, obovate l., and pedunculate heads $1\frac{1}{2}$ in. in diam., with a white ray, brownish beneath, and a yellow disk. Cape.

Diospyros aurantium, D. Bertii, D. elliptica, and **D. Sahuti,** var. **gallica,** André. (*R. H.* 1887, p. 349 with pl.) Ebenaceæ. Garden vars. of **D. Kaki.**

Diospyros Wiseneri, Carrière. (*R. H.* 1887, p. 83). H. shr. with elongate ovate l., shortly attenuated and rounded at the apex; Calyx lobes with a short central lobe. Fruit, egg shaped, obscurely ribbed. Japan. Probably a var. of **D. Kaki.**

Disa racemosa, L. f. (*G. C.* 1887, v. 2, p. 809.) Orchideæ. A beautiful terrestrial orchid wlth light green narrow-lanceolate l., and a lax, one-sided, raceme of pretty rose-purple fl. about $1\frac{1}{2}$ in. in diam. The upper sep. is hooded with a short spur; the side sep. are elliptic-oblong apiculate; pet. small, oblong, with an inflexed point; lip small, lanceolate. Cape.

Disporum Leschenaultianum, Don. (*B. M.* t. 6935.) Liliaceæ. G. per. herb, with a creeping rootstock; erect dichotomously branched stem; shortly stalked, elliptic, acute, 5-nerved l.; and axillary clusters of from 2–5, pedicellate, campanulate, white fl., followed by globose black berries. S. India and Ceylon.

Dracæna sepiaria, Dammann. *Gfl.* 1887, p. 130.) Liliceæ. S. per. of ornamental character, with upright, small, dark green l. in tufts, and large panicles of pure white fl., followed by yellow berries, which remain on the plant for a long time. Fiji.

Epidendrum atropurpurem, var. **Randi,** Linden and Rodigas. (*L.* v. 2, p. 5, pl. 49.) Orchideæ. A var. with ovate-conical bulbs, strap-shaped acute l., 6 8 in. long, $\frac{1}{2}$ in. broad, and racemes of fl. $1\frac{3}{4}$ in. in diam. Sep. and pet. oblanceolate, brown, edged with yellowish. Lip white, striate with red on the side lobes, and with a large radiating red blotch on the broad, transversely oblong front lobe. Amazons. Syn. *E. Randianum*, Barb. Rodriguez.

Epidendrum Kienastii, Rchb. f. (*G. C.* 1887, s. 2, p. 126.) A handsome species with 2 cuneate-oblong acute l., 6 in. long, ½–1 in. broad, and a several flowered raceme of rose-coloured fl., marked with purple veins on the sep. and pet., and with purple raised lines on the white lip. Sep. lanceolate, the dorsal one broader at apex. Pet. cuneate-oblong acute. Lip with the side-lobes cuneate-oblong, 2-toothed, and the mid lobe cuneate-oblong acute, wavy; crest forcipate, 2-shanked, with 5 elevated lines.

Epidendrum Mathewsii, Rchb. f. (*G. C.* 1886, v. 26, p. 458, and 1887, v. 2, p. 431.) One of the *Nanodes* group, with short procumbent stems, and distichous, rigid, fleshy l. Sep. and pet. small, nearly transparent, stained with purplish outside, lateral sep. connate half-way up. Lip orbicular, bifid at apex, convex above, concave beneath, deep shining dull blood-purple, completely concealing the lateral sep.

Epidendrum Stamfordianum, var. **Wallacei,** Rchb. f. (*G. C.* 1887, v. 1, p. 543.) A variety having the front lobe of the lip obcordate, entire, and very narrow. Mountains south of Bogota.

Epidendrum vitellinum, var. **giganteum,** Warner. (*W. S. O. P.* ser. 3, pl. 27.) A syn. of **E. vitellinum** var. **majus.**

Eria Fordii, Rolfe. (*G. C.* 1886, v. 26, p. 584.) Orchideæ. Closely allied to E. rosea, but differing in the larger and differently coloured fl. Bulbs ovoid, sub-compressed, smooth. L. linear-lanceolate acute, 8–9 in. long, 1½–1¾ in. broad, leathery. Racemes terminal, 2–3-flowered. Ovary acutely 3-keeled. Sep. an inch long, lanceolate acute, acutely keeled down the back, light yellowish green. Pet. ovate-lanceolate, subacute, coloured like the pet. Lip narrow oblong, obtuse, apiculate, with small rounded lateral lobes, and 3 blunt keels on lower half, deep dull yellow with dull crimson veins. Hong Kong.

Eria muscicola, Lindl. *G. C.* 1887, v. 2, p. 522.) An insignificant species, with minute bulbs, l. about ½ in. long, and racemes of very small yellowish-green fl. Ceylon.

Erythea armata, Wats. (*G fl.* 1887, p. 279, f. 74, where it is wrongly named *E. aculeata.*) Palmæ. S. Palm with large, fan-shaped, palmatisect, glaucous l., armed with spines on the margins of the petioles; and tomentose, paniculate, pendent spadices. California.

Escallonia revoluta, Pers. (*B. M.* t. 6949.) Saxifrageæ. H. shr., autumn-flowering, much branched and softly pubescent, very ornamental. L. obovate, acute, toothed, with recurved margins, 1–1½ in. long. Racemes panicled at the ends of the branches. Fl. white, ½ in. long. Chili.

Esmeralda Clarkei, Rchb. f. (*G. C.* 1886, v. 26, p. 552. *See* **Vanda Clarkei.**

Eucomis pallidiflora, Baker. (*G. C.* 1887, v. 2, p. 154.) Liliaceæ. G. bulb. A fine bold species with oblanceolate bright green l., 2 ft. or more long, by 4–5 in. broad, and a fl.-stem 3 ft. high, with a long raceme of greenish-white fl., 1¼ in. in diam.

Eurya vitiensis, A. Gr. (*G fl.* 1887, p. 130.) Ternstroemiaceæ. S. tree with elliptic-lanceolate, or oblong serrulate l., acuminate at both ends, of a shining green, and small axillary unisexual fl., the males fascicled, the females usually in pairs. Fiji.

Euonymus japonicus, vars. **Chouveti** and **columnaris,** Carrière. (*R. H.*, 1887, p. 89.) Celastrineæ. H. shr. Garden varieties.

Ficus Cavroni, Carrière. (*R. H.* 1887, p. 329.) Urticaceæ. S. shr. with large shortly petiolate, cuneate-obvate, obtuse l., growing to 18 ins. long by 9 ins. broad, dark green with yellowish-white midrib above, rusty beneath. Brazil.

Fourcroya Roezlii, André. (*R. H.* 1887, p. 353, f. 71.) Amaryllidaceæ. G. L. 4½ ft. long, 4 ins. broad in the middle, narrowed towards the base, lanceolate acuminate. Fl.-stem 10–12 ft. high, clothed with long sheathing bracts on the unbranched part, paniculate above, flowering branches puberulous, fl. in clusters of 3–4, pale yellowish, 1¾ ins. in diam. Mexico. Syn. *Roezlia regia* of gardens.

Fraxinus aucubæfolia, var. **nova,** Carrière. (*R. H.* 1887, p. 63.) Oleaceæ. H. tree. Garden variety.

Fraxinus turkestanica, Carrière. (*R. H.*, 1887, p. 63.) H. tree. A remarkable species, with pinnate, dark green l., leaflets five, cuspidate coarsely toothed. Turkestan.

Fritillaria armena, var. **fusco-lutea,** Baker. (*G. C.* 1887, v. 1, p. 639.) Liliaceæ. H. bulb. A form having the fl. bright yellow inside and tinged with coppery-brown outside. Smyrna.

Fritillaria Raddeana, Rgl. (*G fl.* 1887, p. 583.) H. bulb, similar to F. imperialis, but distinguished by its rather dwarfer habit, recurved-spreading floral l., and pedicels longer than the greenish-yellow fl. Central Asia.

Gahnia aspera. (*Gfl.*, 1887, p. 130.) Cyperaceæ. S. The plant described under the above name may not be the true *G. aspera.* Spr. It is said to be an ornamental plant of Arundo-like habit, with bright green, channelled, wavy, lanceolate l., and a terminal inflorescence of whitish-yellow spikelets and red-yellow fruit. Fiji.

Galanthus caucasicus, Baker. (*G. C.* 1887, v. 1, p. 313.) Amaryllidaceæ. A large-flowered species, with glaucous truncate l. ½ in. broad, very glaucous peduncles, and fl. ¾–1 in. long, white, with the inner segments streaked with green inside, and marked outside with a green horseshoe-shaped spot around the deep notch. Caucasus.

Galeandra Descagnolleana, Rchb. f. (*Ill. H.* v. 34, p. 63, pl. 22.) Orchideæ. Allied to *G. dives,* with rather slender fusiform stems, narrow lanceolate acuminate l., and terminal few-flowered racemes of moderate-sized fl. Sep. and pet. lanceolate acute, ochreous-brown. Lip pale sulphur-white, with a purple blotch in front. Para.

Galeandra devoniana, var. **Delphina.** (*L.* v. 2, p. 67, pl. 80; *G. C.* 1887, v. 1, p. 486.) A distinct var. more slender in all its parts than the type. Sep. and pet. lanceolate acute, reddish brown with yellowish margins. Lip large, white, veined with purple. Venezuela.

Galeandra flaveola, Rchb. f. (*G. C.* 1887, v. 1, p. 512, and v. 2, p. 108; *L.* v. 2, p. 87, pl. 90.) A strong-growing species, with stems a span high, rather thick at the base, marked on the whitish sheaths with dark spots. L. cuneate, linear-lanceolate, acuminate, ½–¾ in. broad. Raceme several flowered, sep. and pet. lanceolate, acuminate, yellowish-brown. Lip yellow, with very small hyaline purple dots. Anther with a blackish anchor-like terminal process. Venezuela.

Geranium tuberosum, var. **Charlesii,** Ait. and Hemsl. (*B. M.* t. 6910; *R. H.* 1887, p. 167.) Geraniaceæ. H. per., differing from the type in having a series of globose superimposed tubers, and the segments of the l. less lobed at their sides. Afghanistan.

Gladiolus watsonioides, Baker. (*B. M.* t. 6919; *R. H.* 1887, p. 192.) Iridaceæ. G. Allied to *G. Watsonius,* with linear l. 1–1½ ft. long, ½ in. broad, and a long lax spike of showy bright scarlet-red fl. 2 in. in diam. Mount Kilimanjaro.

Globba alba, Morren. (*B. H.* v. 35, p. 286, pl. 20.) Scitamineæ. S. This is a synonym of **G. albobracteata,** N. E. Br.

Glyptostrobus columnaris, Carrière. (*R. H.* 1881, p. 528.) Coniferæ. H. tree. Garden variety. Seems to be the same as **Taxodium distichum** var. **fastigiatum.**

Goodyera Rodigasiana, Linden. (*Ill. H.* v. 33, p. 175, pl. 616; *G. C.* 1886. v. 26, p. 779.) Orchideæ. S. terrestrial orchid, of dwarf robust habit, with thick, ovate, acute, velvetty green l., with a whitish-green central stripe. Fl. unknown. New Guinea.

Gongora flaveola, Rchb. f. (*G. C.* 1886, v. 26, p. 456.) Orchideæ. Allied to *G. gratulabunda,* with an angulate peduncle bearing a rich raceme of distant fl. of a light ochre-yellow spotted with brown, the lip with a sigmoid claw, and having a median arista and very small basilar horns to the hypochile (middle part of lip).

Gonioscypha eucomoides, Baker. (*G. C.* 1886, v. 26, p. 744.) Liliaceæ. S. per. of striking appearance, with a short fleshy rootstock and a rosette of petiolate, elliptic, acute l., a ft. long by 4–5½ in. long., scape bearing a dense spike of dull green fl., surmounted by a crown of fine subulate bracts, similar bracts being mixed with the fl. Bhotan.

Habenaria militaris, Rchb. f. (*G. C.* 1886, v. 26, p. 518; *W. O. A.* v. 6, pl. 281.) Orchideæ. S. terrestrial orchid, a foot or more in height, with linear acute l., 8–9 in. long, ½ in. broad, and a lax raceme of moderate-sized fl., with green sep. and pet. and a scarlet lip. The dorsal sep. has the pet. strongly adherent to it, forming a cucullate-navicular helmet. The lateral sep. are oblong acute, reflexed and revolute. Lip with spreading oblong-dolabriform side lobes, and a bifid front lobe with divergent triangular lobes. Cochin China.

Hæmanthus abyssinicus, Herb. (*Bull Cat.*, p. 10.) Amaryllidaceæ. A fine S. bulb, with ovate-lanceolate wavy l., and large umbels of rich salmon-pink fl. Abyssinia.

Hebenstretia tenuifolia, Schrad. (*G. C.* 1887, v. 2, p. 398, under *Dimorphotheca fruticosa.*) Selagineæ. H. annual, a ft. or more high with linear, entire or slightly toothed l., and long spikes of small white fl. marked with different shades of orange in the throat. S. Africa.

Hedysarum microcalyx, Baker. (*B. M.* t. 6931.) Leguminosæ. H. An ornamental leafy shr. nearly glabrous. L. pinnate, 6–12 in. long, with 17–21 oblong, obtuse leaflets. Racemes 6–10 in. long, on very long peduncles, many flowered, fl. $\frac{3}{4}$ in. long bright purple. N.W. Himalaya.

Helicophyllum Alberti, Rgl. (*B. M.* t. 6969; *G. C.* 1887, v. 2, p. 754.) Araceæ. H. per. An Arum-like plant, with hastate l., having two long linear basal lobes with an occasional side lobe, standing erect in front of the blade. Peduncle very short. Spathe 6 in. long, oblong, acute, the tube inside and out, and the back of the limb pale green, inside the limb is rich brown-purple. Central Asia.

Helicteres isora, L. (*G. C.* 1887, v. 2, p. 366.) Sterculiaceæ. S. shr. with large, roundish, crenate-dentate, cuspidate l., somewhat unequally cordate at the base, tomentose beneath, and small axillary clusters of deep red fl. Fr. twisted. India.

Heliophila scandens, Harv. (*G. C.* 1887, v. 1, p. 252.) Cruciferæ. G. An interesting climbing crucifer, with slender twining stems, lanceolate l., and racemes of large white fl. sometimes tinted with rosy. Natal.

Heloniopsis umbellata. (*G. C.* 1887, v. 1, p. 711.) The name *H. umbellata* is a mistake for **H. japonica.** Liliaceæ. H. per. of interesting character, with a rosette of lanceolate light green l., brownish towards the tips, and a few-flowered raceme of rose-coloured fl., having narrow free segments. Japan.

Hemipilia calophylla, Par. and Rchb. f. (*B. M.* t. 6920.) Orchideæ. S. terrestrial orchid, with a solitary oblong or elliptic, acute l., of a dark green, beautifully mottled with purple-brown, and a lax raceme of moderate-sized fl. Sep. ovate, acute, white, with green mid line. Pet. smaller, white. Lip oblong, slightly lobed, $\frac{1}{3}$ in. long, rich purple. Tenasserim.

Heuchera sanguinea, Engelm. (*B. M.* t. 6929.) Saxifragaceæ. H. per. herb, the most beautiful of the genus. L. on long hairy petioles, cordate-orbicular, shortly lobed, and coarsely crenate. Fl.-stem 12–18 in. high, with a paniculate inflorescence of drooping, bright crimson, campanulate fl. $\frac{1}{2}$ in. in diameter. New Mexico and Arizona.

Hexisea bidentata, Lindl. (*G. C.* 1887, v. 2, p. 431.) Orchideæ. A pretty little orchid, with jointed stems, constricted at the nodes, the joints 1–$1\frac{1}{2}$ in. long. L. linear-oblong, not longer than the joints. Fl. in short racemes, arising from the nodes, bright scarlet, about $\frac{1}{2}$ in. in diameter; sep. and pet. linear acute, lip narrow, obovate-oblong. Panama, Colombia.

Hibiscus cisplatanus, St. Hil. (*G. C.* 1887, v. 2, p. 366.) Malvaceæ. G. shr. with ovate acuminate l., with a tendency to become 3-lobed, and pale rosy-lilac fl. $2\frac{1}{2}$ in. in diameter, with a campanulate calyx surrounded by numerous linear bracts. Brazil.

Hibiscus coccineus, Walt. (*G. C.* 1887, v. 2, p. 366.) This is the same as *H. speciosus* Ait., being the oldest name for that plant.

Hillebrandia sandwicensis, Oliver. (*B. M.* t. 6953; *G. C.* 1887, v. 1, p. 804; and v. 2, p. 341.) Begoniaceæ. S. herb of interesting character, with the habit and appearance of a Begonia. L. large, roundish, many lobed, deeply cordate at base, serrate, hairy, dark green. Peduncles 6–12 in. long, forked at the top, bearing compact cymes of white fl. $\frac{3}{4}$ in. in diameter, with 5 sep. and 5 small spathulate pet. Sandwich Islands.

Hyacinthus lineatus, Steud. (*Gfl.* 1887, p. 446, f. 114.) Liliaceæ. H. spring-flowering bulb, with two oblong-lanceolate, acute l., 2–$2\frac{1}{2}$ in. long, $\frac{1}{3}$–$\frac{1}{2}$ in. broad, and a scape 2–4 in. high, with a short raceme of ascending, small, campanulate blue fl. Asia Minor.

Hydrosme Leopoldiana, Mast. (*G. C.* 1887, v. 1, p. 642, and p. 644–45. f. 122–123; *Ill. H.* v. 34, p. 65, pl. 23.) Araceæ. S. tuberous-rooted aroid with a solitary l., having a petiole 2 ft. high, green dotted with purple at the base, and a horizontally spreading 3-branched blade, the branches being 2–3 times pinnatised with narrow lanceolate acuminate segments. Spathe vase-shaped at the base, prolonged into a broadly lanceolate wavy limb, velvetty purple-brown. Spadix 2 ft. long, cylindric, tapering, only the basal 3–4 in. bearing flowers, the rest naked and smooth. Congo.

Ilex camelliæfolia, Carrière. (*R. H.* 1887, p. 234.) Ilicineæ. H. shr. A garden var. of the common Holly.

Ilex Fischeri, of gardens. (*R. H.* 1887, p. 53.) A garden var. of the common Holly.

Impatiens comorensis, Baker. (*Ill. H.* v. 34, p. 62; *R. H.* 1887, p. 434.) Geraniaceæ. S. herb. A pretty balsam of vigorous growth, with elliptic-lanceolate, acute, crenate l., and large bright carmine fl., having a bifid white spur. Comoro Islands.

Ipomœa Robertsii, Hook. f. (*B. M.* t. 6952.) Convolvulaceæ. S. A beautiful twiner, softly pubescent except the fl. L. petiolate, cordate acute, 3–4 in. long, the hairs more or less stellate on both sides, with some scales on the upper surface. Fl. solitary pedunculate, 3 in. in diam., white, striate with pink, and marked with five rosy-purple rays. Queensland.

Iris Biliotti, Foster. (*G. C.* 1887, v. 1, p. 738.) Iridaceæ. H. A handsome, sweet-scented species, resembling *I. germanica* in habit. Fl.-stem $2\frac{1}{2}$–3 ft. high. Falls $3\frac{1}{2}$ in. long, $1\frac{1}{2}$ in. broad, cuneate-spathulate, reddish-purple, with fine blackish veins, bearded. Standards $3\frac{1}{2}$ in. long, 2 in. broad, connivent, blue-purple with fine blue veins. Styles obovate, white, with triangular reddish-purple crests. Province of Siwas, Asia Minor.

Iris Boissieri, Henriquez. (*G. C.* 1887, v. 2, p. 38.) H. A handsome bulbous species, closely allied to *I. filifolia*, but differing in having a distinct tube above the ovary, broader and more obovate standards, and a long narrow claw to the outer segments, which are distinctly bearded. Fl. purple. Portugal.

Iris Duthieii, Foster. *G. C.* 1887, v. 1, p. 611.) H. Rhizome knotty and gnarled. L. appearing after the fl., five or six to a tuft, 2 ft. long, $\frac{1}{2}$ in. broad, yellowish green. Fl. solitary sessile; tube 3 in. or more long; falls nearly horizontal, lanceolate, bearded, above red-lilac with darker veins and blotches, beneath greenish yellow with the veins and blotches showing through; standards connivent, $1\frac{1}{4}$ in. long, oblong-ovate, paler red-lilac with dark veins. Styles light red-lilac with triangular crenate crests. Kumaon.

Iris germanica, var. **Siwas,** Foster. (*G. C.* 1887, v. 1, p. 739.) A variety with dark indigo-purple falls having light blue-purple claws, and dark blue-purple standards. Fr. very short, not much longer than broad. Province of Siwas, Asia Minor.

Iris Hookeriana, Foster. (*G. C.* 1887, v. 1, p. 611.) H. Rhizome somewhat fleshy. L. 1 ft. long, $\frac{3}{4}$–1 in. broad, yellowish-green, appearing with the fl. Scape about 5 in. long, 2-flowered. Fl.-tube $\frac{1}{2}$–$\frac{1}{3}$ in. long; falls obovate-lanceolate, $1\frac{3}{4}$ in. long. by $\frac{7}{8}$ in. broad, reflexed, densely bearded, blue-purple with darker blotches above, green with purple borders beneath; standards narrow obovate, $\frac{3}{4}$ in. long, $\frac{1}{2}$ in. broad, blue-purple. Styles reddish-purple, very concave, with triangular, serrate, revolute crests. Lahul.

Iris Kingiana, Foster. (*G. C.* 1887, v. 1, p. 611; and v. 2, p. 341; *B. M.* t. 6957.) H. Rhizome knotty. L. 2 ft. long, $\frac{1}{2}$ in. broad, yellowish green, appearing along with the solitary sessile fl. Tube $2\frac{1}{2}$ in. long; falls lanceolate-ovate, $1\frac{1}{2}$ in. by $\frac{5}{8}$ in., reflexed, bearded, purple with deep purple spots above, greenish white beneath, with the spots showing through; standards erect, oblong-ovate, $\frac{3}{4}$ in. long, nearly $\frac{1}{2}$ in. broad, purple. Styles purple with paler margins, crests obtusely triangular, reflexed, serrated and darker purple on the edge. Garwhal.

Iris lineata, Foster. (*Gfl.* 1887, p. 201, t. 1244, f. 1–6; *G. C.* 1887, v. 1, p. 679.) H. A small species, growing to about 1 ft. high, with a creeping rhizome producing bulbs at intervals, and erect, narrow, acute l., as long as the one-flowered scape. Fl. with lanceolate acute segments, greenish-yellow, veined with dull red-purple, the falls bearded with bluish-purple hairs and recurved, the standards erect, bearded with brownish-purple. Caucasus.

Iris lupina, Foster. (*G. C.* 1887, v. 1, p. 738.) H. Rhizome fleshy, creeping. L. 9 ins. or more long, $\frac{1}{2}$ in. broad, light green. Peduncle 6 in. high, 1-flowered. Fl.-tube about 2 in. long; falls 3 in. long by $1\frac{3}{4}$ in. broad, broadly lanceolate, reflexed, serrate, bearded, greenish-yellow, with brownish-red veins towards the margins. Standards, $3\frac{3}{4}$ in. long, $2\frac{1}{3}$ in. broad, elliptic, connivent, crenate, bearded, coloured like the falls. Styles much recurved, with rounded crests, yellow with brownish-red veins and dots. Kharput.

Iris Sari, var. **lurida,** Boiss. (*B. M.* t. 6960.) H. A fine Iris, with a short oblique rhizome, bearing about six, falcate glaucescent l. Peduncle 1-flowered. Fl. large; falls spotted with purple-brown on a pale ground, with a large blackish blotch at the base; standards large, roundish, violet-purple, veined and spotted with darker. Asia Minor.

Iris vaga, Foster. (*Gfl.* 1887, p. 201, t. 1244, f. 7.) H. Bulbs stoloniferous. L. a ft. long, nearly 1 in. broad. Scape, 2 ft. high, 3-flowered. Falls obovate? yellowish, with purple veins and margin, bearded with bluish-white. Standards broadly lanceolate, acute, erect, dull purple, with the veins, margin, and apex fuscous, bearded with whitish-yellow. Turkestan.

Karatas acanthocrater, Baker. (*B. M.* t. 6904.) Bromeliaceæ. Syn. *Nidularium acanthocrater*. Morren.

Kniphofia Kirkii, Baker. (*G. C.* 1887, v. 2, p. 712.) Liliaceæ. H.? per. much in the way of K. aloides, with green, acutely keeled l. 5–6 ft. long, $1\frac{1}{2}$–2 in. broad at base, scabrous on the edge and keel. Peduncle 4 ft. high, with two large bract-leaves. Raceme dense. Bracts firm and green, concave and half twisted to one side. Fl. $1\frac{1}{4}$–

1½ ins. long, reddish-orange, gradually narrowed towards the base. South-east Trop. Africa.

Kniphofia pallidiflora, Baker. (*G. C.* 1887, v. 2, p. 396; *R. H.* 1887, p. 166) G. A distinct, small-flowered species, 1–2 ft. high, with linear semiterete l., 6–12 ins. long by 1 line broad, and a raceme of somewhat funnel-shaped white fl. 4½ lines long. Madagascar.

Laburnum caramanicum, Bth. Leguminosæ. H. shr., having the general aspect of Cytisus purpureus. L. petiolate, digitately trifoliolate, the leaflets obovate ¼–¾ in. long. Fl. bright yellow, about ½ in. in expanse, disposed in terminal paniculate racemes. Greece. Syn. *Podocytisus caramanicus*, Boiss.

Lachenalia aureoxreflexa, Baker. (*G. C.* 1887, v. 1, p. 576.) Liliaceæ. Garden hybrid.

Lælia anceps, var. **Schroederæ,** Rchb. f. (*G. C.* 1887, v. 1, p. 72.) Orchideæ A fine variety, having the sep. whitish-rose; the pet. rose with purple tips; and the lip with a brown disk, yellow side areas, warm purple borders to the side lobes, and a very dark blackish-purple front lobe.

—— Var. **Stella,** Crawshay. (*G. C.* 1887, v. 1, pp. 152 and 280, f. 58, and p. 312.) This may be described as a large-flowered form of the var. **Williamsii,** with a yellow throat to the lip marked with carmine lines, the rest of the fl. being pure white.

—— Var. **virginalis.** (*G. C.* 1887, v. 1, p. 11.) Orchideæ. A beautiful pure white-flowered variety, marked only on the disk and crests of the lip with pale sulphur-yellow.

Lælia autumnalis, var. **venusta,** Backhouse. (*Veitch Man. Cattl. and Lælia*, p. 62.) A large-flowered var., with fl. of a nearly uniform rosy-mauve.

—— Var. **xanthotropis,** Rchb. f. (*R.* v. 1, p. 21, t. 10; *Veitch Man. Cattl. and Lælia*, p. 62.) A pretty var. with shorter and smaller, rigid, leathery l., and broader pet. than in the type. The fl. are in drooping racemes and of a delicate rosy purple, with the tips of the sep. and pet. and front lobe of lip darker purple, the keels are yellow. Mexico.

Lælia cinnabarina, var. **crispilabia,** Veitch. (*Veitch Man. Cattl. and Lælia*, p. 63.) Syn. *L. crispilabia*, Rich.

Lælia Dominyana, var. **rosea,** Veitch. (*Veitch Man. Cattl. and Lælia*, p. 95.) Garden hybrid.

Lælia elegans. Those following, without a given reference, are now referred as vars. of this in *Veitch Man. Cattl. and Lælia*, pp. 67 and 68.

Lælia elegans—*cont.*

—— Var. **gigantea,** Veitch. Syn. *L. gigantea*, Warner.

—— Var. **Houtteana,** Rchb. f. (*L.*, v. 2, p. 49, pl. 71.) A handsome var. with rich rose-purple fl., the side lobes of the lip being whitish. Sep. lanceolate acute with recurved tips. Pet. twice as broad as the sep. rhomboid, obtuse. Santa Catharina, Brazil.

—— Var. **incantans.** Rchb. f. (*G. C.* 1887, v. 2, p. 333.) A handsome large-flowered var., with dark nankeen sep. and pet. suffused with light purple at the edges, and the lip with the front lobe and tips of the side lobes rich dark purple, the disk being reddish and the rest white, partly suffused with pale yellow.

—— Var. **Measuresiana,** Rchb. f. (*G. C.* 1887, v. 1, p. 209.) A fine variety with sulphur-coloured sep. and pet.; the sep. washed and spotted outside with light brown-purple; pet. bordered with purple on the apical part. Lip with the front lobe dark purple, disk purple, side areas white, and apex of side lobes purple.

—— Var. **Schilleriana,** Veitch. Syns. *L. Schilleriana*, Rchb. f., *L. Warneri*. Warner.

—— Var. **Stelzneriana,** Veitch. Syn. *L. Stelzneriana*, Rchb. f.

—— Var. **Turneri,** Veitch. Syn. *L. Turneri*, Warner.

Lælia euspathæ, Rchb. f. (*R.* v. 1, p. 17, t. 8; *Veitch Man. Cattl. and Lælia*, p. 88.) A fine species allied to *L. purpurata* and *L. elegans*, with stout clavate bulbs a ft. high, having one thick oblong emarginate l., 9–11 ins. long, by about 2½ ins. broad. Spathes large, 4–5 ins. long. Fl. large, delicate rosy-white on the lanceolate sep. and pet. The obscurely three-lobed lip is pale yellow in the tube and rich dark purple on the front part. Brazil.

Lælia exoniensis, Veitch. (*Veitch Man. Cattl. and Lælia*, p. 95.) Syn. *Cattleya exoniensis*.

Lælia felix, Veitch. (*Veitch Man. Cattl. and Lælia*, p. 96.) Syn. *Cattleya felix*, Rchb. f.

Lælia irrorata, var. **Gaskelliana,** Rchb. f. (*G. C.*, 1887, v. 2, p. 520.) A var. with white lilac sep. and pet., and a dark purple front lobe to the lip, marked with darker purple, the area between the lilac-tipped side lobes is white with a lilac mid line.

Lælia lilacina, Philbrick. (*Veitch Man. Cattl. and Lælia*, p. 89.) Peduncle 2 or more flowered. Sep. and pet. pale lilac. Lip white marked on the inside of the side lobes with purple lines, and with a rayed purple blotch on the disk.

Lælia Lindleyana, Veitch. (*Veitch Man. Cattl. and Lælia*, p. 73.) Syn. *Cattleya Lindleyana*, Rchb. f.

Lælia lobata, Veitch. (*Veitch Man. Cattl. and Lælia*, p. 74, with fig.) This is a synonym of **L. Boothiana,** Rchb. f., and is the same as *L. Rivieri*, Carr., and *Cattleya lobata*, Lindl.

Lælia pumila, var. **Curleana,** Rchb. f. (*G. C.* 1886, v. 26, p. 712.) A variety having a few dark streaks on the sep., and some oblique radiating lines on the margins of the pet. and outside the lobes of the lip.

—— Var. **præstans,** Veitch. (*Veitch Man. Cattl. and Lælia*, p. 79.) Syn. *L. præstans*, Rchb. f.

Lælia purpurata, var. **Lowiana,** Rchb. f. (*G. C.* 1887, v. 1, p. 799.) A variety with rose-coloured sep. and pet., and a very dark mauve-purple lip with very little yellow at the base.

—— Var. **Russelliana,** Williams. (*W. O. A.* v. 6, pl. 269.) Syn. *L. Russelliana.*

Lælia rubescens, var. **alba,** Veitch. (*Veitch Man. Cattl. and Lælia*, p. 82.) A var. with white fl. marked with a yellow stain on the lip.

—— Var. **rosea,** Veitch. (*Veitch Man. Cattl. and Lælia*, p. 82.) Fl. rosy-mauve, with a dark purple blotch on the lip. Syn. *L. peduncularis*, Lindl.

Lælia triophthalma, Veitch. (*Veitch Man. Cattl. and Lælia*, p. 97.) Syn. *Cattleya triophthalma*, Rchb. f.

Landolphia florida, Bth. (*B. M.* t. 6963; *G. C.* 1887, v. 1, p. 804.) Apocyneæ. S. A handsome climber, with large, opposite, elliptic-oblong, bluntly pointed l., and dense compact cymes of fragrant white fl., 1¾ in. in diam., with narrow spreading lobes. Trop. Africa.

Lapeyrousia grandiflora, Baker. (*B. M.* t. 6924.) Iridaceæ. G. A handsome species similar in habit to Anomatheca cruenta, but larger. Corm small, stoloniferous. L. 6–12 in. long, ½ in. broad. Spikes 4–10-flowered. Fl. 2 in. in diam., bright red with a yellow eye, and the 3 lower segments marked with a large, triangular, dark crimson spot. S. E. Trop. Africa. Syn. *Anomatheca grandiflora*, Baker.

Lastrea Jenmani, Bull. (*Bull. Cat.*, p. 11.) Filices. S. Fern with stout, erect, scaly stipes, and bipinnate fronds, about 2 ft. long by 9–12 in. broad, densely pellucid dotted. Jamaica. A synonym of **Nephrodium Jenmani,** Baker.

Lastrea lepida, T. Moore. (*G. C.* 1886, v. 26, p. 681.) S. An elegant fern, with ovate-acuminate fronds, having alternate, very shortly stalked, lanceolate-acuminate, pinnatifid pinnæ, the central ones longest, glabrous, with hairy midribs and setose margins; sori placed near the midribs on each side, with inflated, roundish-reniform, lead-coloured, hairy indusia. Stipes green, setose on the margin of the groove down the face.

Leschenaultia Baxteri, var. **major,** Carrière. (*R. H.* 1886, p. 468, with pl.) Goodeniaceæ. G. A dwarf, much branched, free-flowering shr., with close-set, linear l., and numerous dark orange-red, pendulous fl., on peduncles about ¾ in long. The corolla is two-lipped, with unequal divisions, three being much larger than tho other two, and notched at their tips. Australia.

Ligustrum japonicum, var. **Alivoni,** André. (*R. H.* 1886, p. 537.) Oleaceæ. H. shr. A robust form with ovate-lanceolate, acuminate, entire l., narrowed at the base, wavy at the margin, of a dark shining green, irregularly variegated with pale yellowish. Garden variety.

Ligustrum rosmarinifolium, Carrière. (*R. H.* 1887, p. 63.) H. shr. Garden variety.

Liparis elegans, Ldl. (*G. C.* 1886, v. 26, p. 558.) Orchideæ. Bulbs ovate, 1–3-leaved. L. 3–8 in. long, lanceolate-linear acute. Fl. stem 1–1½ ft. high, bearing a many flowered raceme of pale greenish fl. with an orange-red lip. Penang.

Littonia modesta, var., **Keitii,** Leichtl. (*Gfl.* 1886, p. 677, t. 1237.) Liliaceæ. G. bulb. A more robust form than usual. S. Africa.

Lonchocarpus Barteri, Benth. (*B. M.* t. 6943, *G. C.* 1886, v. 26, p. 785.) Leguminosæ. S. A handsome climber, with pinnate l., having 5–7 elliptic-oblong, acuminate leaflets, 4–7 in. long, and elegant paniculate racemes of clustered pink fl., with reddish-brown calices. Trop. Africa.

Lycaste plana, var. **Measuresiana,** Williams. (*W. O. A.* v. 7, pl. 306; *G. C.* 1887, v. 2, p. 788.) Orchideæ. A beautiful free-flowering var., with reddish-brown sep. tipped with green, and green outside. Pet. and lip white, densely spotted with rose-purple, except on the margins of the pet. Bolivia.

Lycaste Skinneri, var. **reginæ,** Williams. (*W. O. A.* v. 6, pl. 283.) A var. with light rosy-purple sep. and dark magenta-purple pet and lip. Guatemala.

Mammillaria cornimamma, N. E. Br. (*G. C* 1887, v. 2, p. 186,) Cactaceæ. G. succulent with globose stem, white woolly in the axils of the younger tubercles and spine tufts. Tubercles large, with 10–13 rather stout radiating spines, and 1–3 stouter and longer inner spines. Fl. 3 in. in diameter, light yellow with a purplish stripe down the back of all but the innermost segments, which are all linear-lanceolate acute. Stamens and stigmas yellow, the filaments tinted with orange-red.

Maranta iconifera, Bull. (*Bull Cat.*, p. 11.) Scitamineæ. S. foliage plant. From description this appears to be the same as **Calathea Makoyana.**

Masdevallia acrochordonia, Rchb. f. (*G. C.* 1886, v. 26, p. 526.) Orchideæ. Much in the way of *M. ephippium*, but with narrow and less inflated lateral sep.; and acuminate pet. with a strong spreading angle at their base.

Masdevallia astuta, Rchb. f. (*G. C.* 1886, v. 26, p. 558.) Allied to *M. Gaskelliana*, with oblong acute l., 6–8 in. long. Peduncle about as long as the l., sep. triangular, outside brown, with the centre and apex yellow, inside hispid, ochreous, spotted with brown, tails brown. Lip saccate with 3 keels, pale yellowish. Costa Rica.

Masdevallia demissa, Rchb. f. (*G. C.* 1887, v. 2, p. 9.) L. cuneate-spathulate, very thick. Peduncle much shorter than the l., one-flowered. Fl. with the upper sep. yellow, with 3-brownish-purple lines, and the side sep. brownish-purple, tails yellow, the lower ones descending, the upper one incumbent; sep. triangular, the lateral ones connate and much longer than the dorsal one. Costa Rica.

Masdevallia Galeniana, Rchb. f. (*G. C.* 1887, v. 2, p. 586.) Garden hybrid.

Masdevallia glaphyrantha, Rchb. f. (*G. C.* 1886, v. 26, p. 648; *Gfl.* 1887, p. 340.) Garden hybrid.

Masdevallia Hincksiana, Rchb. f. (*G. C.* 1887, v. 2, p. 214.) Garden hybrid.

Masdevallia ignea, var. **Massangeana,** Williams. (*W. O. A.* v. 6, pl. 273.) A trifling var. with darker scarlet fl. New Granada.

Masdevallia pusiola, Rchb. f. (*G. C.* 1887, v. 1, p. 140.) The smallest known species of this genus, with lanceolate l. an inch long, and small yellow fl. $\frac{1}{4}$ in. long, on capillary stalks. Columbia.

Masdevallia sororcula, Rchb. f. (*G. C.* 1887, v. 2, p. 713.) Allied to *M. elephanticeps*, having a very similar fl., but the angular projection of the fissure of the lateral sep. is not developed, and the lip is three-lobed. Outside the fl. is greenish, with purplish dots on the nerves; inside the upper sep. is pallid, with three purple lines, and the lateral sep. purple, with green tails. Pet. white, with dark purple mid line. Lip white and purple.

Masdevallia Wendlandiana, Rchb. f. (*G. C.* 1887, v. 1, p. 174.) A small white-flowered species. L. spathulate, minutely bilobed. Peduncle 1-flowered; fl. $\frac{2}{3}$ in. long, the tails equal to the free part of the sep., white, with 2–3 mauve lines outside beneath. New Granada.

Matricaria eximia, var. **pyramidalis,** Carrière. (*R. H.* 1886, p. 557, f. 131.) Compositæ. H. annual or per. A form of compact and somewhat pyramidal habit. Garden variety.

Maxillaria fucata, Rchb. f. (*G. C.* 1886, v. 26, p. 616.) Orchideæ. Allied to *M. irrorata*, but with no powder on the lip. L. oblong-lanceolate acuminate, 8–9 in. long, on petioles 5–7 in long. Peduncles a span long, with many sheaths. Sep. triangular, the lateral ones broadest, with reflexed tips, white outside; inside white at base, purple in the middle, and yellow with red spots at apex. Pet. rhomboid, blunt-angled at the sides, coloured like the sep. but without the apical spots. Lip oblong-elliptic, trifid in front, side lobes rounded, mid lobe small, semi-oblong, emarginate, ochreous, marked with brown stripes, and with brown marginal parts to the side lobes.

Maxillaria molitor, Rchb. f. (*G. C.* 1887, v. 2, p. 242.) Allied to *M. grandiflora*, with similar bulbs and l., and smaller fl. Sep. acute, yellow, tinged with brown on the upper halves outside; pet. smaller, oblong-lanceolate, yellow. Lip with rounded, yellow side lobes. dotted on the margin with brown, and a triangular, obtuse, wavy, brown front lobe, the disk is mealy with a crescent-shaped naked crest.

Maxillaria Sanderiana, Rchb. f. (*R.* v. 1, p. 57, t. 25; *G. C.* 1887, v. 1, p. 485.) A magnificent species with compressed one-leaved bulbs. L. stalked, broadly oblong, obtuse, apiculate. Fl. 4–5 in. in expanse, ivory white, with the base of the sep. and pet., and the outside of lip dark vinous-crimson. On the sep. and pet. the upper part of the crimson breaks up into spots and streaks. The inside of the lip is yellowish, with vinous-crimson spots. Peru.

Miltonia Bluntii, var. **Lubbersiana,** Rchb. f. (*G. C.* 1887, v. 2, p. 649.) Orchideæ. A var. spotted with brown on the sep. and pet., and having a purple lip.

Miltonia spectabilis, var. **lineata**, Linden. (*L.* v. 2, p. 31, pl. 62.) A handsome var. with a large purple blotch at the base of the lip and seven purple veins radiating from it nearly to the margin.

Miltonia spectabilis, var. **Moreliana**, Linden. (*L.* v. 3, p. 21, pl. 105.) Syn. *M. Moreliana.*

Morina betonicoides, Bth. (*B. M.* 6966.) Dipsaceæ. H. A pretty herbaceous per. 10–18 ins. high, with linear-lanceolate, spinose-ciliate l., and heads of bright rose-purple fl., marked with a crimson spot at the base of the three lower lobes of the curved funnel-shaped corolla. Sikkim.

Mormodes pardinum, var. **melanops**, Rchb. f. (*G. C.* 1886, v. 26, p. 680.) Orchideæ. A form with very dark brownish-purple fl.

Mormodes platychila, Rolfe. (*G. C.* 1887, vol. 1, p. 178.) A distinct-looking species with compact, erect racemes of pale buff-coloured fl. over an in. in expanse, marked with many dull purple stripes on the lip.

Mormodes vernixum, Rchb. f. (*G. C.* 1887, v. 2, p. 682.) Allied to *M. buccinator*, with a close raceme of shining blackish-purple fl. Sep. and pet. broad. Lip like that of *M. variabilis*, but without hairs. Roraima.

Mutisia viciæfolia, Cav. (*R. H.* 1887, p. 484.) Compositæ. G. A handsome climber. L. pinnate, ending in a tendril, leaflets numerous, lanceolate, acute, glabrous. Heads showy, orange, the involucre long and cylindric. Peru.

Myriocarpa colipensis, Liebm. (*G. C.* 1887, v. 2, p. 243.) Urticaceæ. S. Shr. of bold habit, with a stout stem, and large, elliptic, acute, bright green l., 15–18 in. long, on stout petioles 10–12 in. long. The small fl. are disposed in pendulous, slender, forked spikes, 1½–2 ft. long. Mexico. Syn. *M. stipitata* (*G. C.* 1887, v. 1, p. 257.)

Mystacidium filicorne, Lindl. (*G. C.* 1887, v. 2, p. 123–5, f. 33, and p. 686.) Orchideæ. A pretty, free-flowering, Angræcum-like orchid, of tufted habit, with narrow oblong l., 2–5 in. long, and about ½ in. broad, obtusely 2-lobed at apex, and racemes of numerous white fl. an in. in diam. Sep., pet. and lip lanceolate acute, spur slender, 2 in. or more long. Natal.

Narcissus cyclamineus, Baker. (*B. M.* t. 6950.) Amaryllidaceæ. H. bulb. A distinct-looking species with small ovoid bulb, producing 2–3 linear, square-keeled l. and solitary fl., with an orange tubular corona, as long as the oblong light yellow perianth segments, which are abruptly reflexed, so that they and the corona are in a line. Portugal.

Narcissus pseudonarcissus, var. **Johnstoni**, Tait. (*G. C.* 1887, v. 1, p. 288, p. 60.) H. A variety with pale sulphur-coloured fl., remarkable for the long and rather slender coronal-tube, which is about ¾ in. long and less spreading at the mouth than in the common Daffodil. Portugal.

Nepenthes Curtisii, Mast. (*G. C.* 1887, v. 2, p. 681 and 689, f. 133.) Nepenthaceæ. S. A handsome Pitcher-plant with oblong l., obtusely bilobed at the apex, and cylindric pitchers, 6–8 in. long, dull green mottled with purple, having fringed wings, a deeply frilled mouth, and an erect ovate wavy lid, which is prettily reticulated with purple on a pale ground, and has a compressed obtuse horn at the base, and a slender horn near the apex inside; a little below the base of the lid on the back of the pitcher is another slender horn or spur. Borneo.

Nepenthes cylindrica, Veitch. (*G. C.* 1887, v. 2, p. 521, f. 103.) Garden hybrid.

Nepenthes Mastersiana, Veitch. (*Veitch Cat.* p. 43, and 46 with fig.; *Ill. H.* v. 33, p. 187, pl. 618.) Garden hybrid.

Nephrolepis rufescens, Splitgerb. var. **tripinnatifida**, Veitch. (*Veitch Cat.* p. 10, and 3 with fig. *G. C.* 1887, v. 1, p. 476, f. 90, and p. 481, p. 91.) Filices S. A handsome decorative fern, with large, graceful, lanceolate fronds, which in the typical form are pinnate with distant lanceolate, entire pinnæ, but in the form figured, the pinnæ are deeply pinnatifid and overlapping; the fronds are clothed, especially beneath, with short reddish hairs. Tropical America.

Nephthytis picturata, N. E. Br. (*G. C.* 1887, v. 1, p. 476; *Bull Cat.* p. 11, and 5 with fig.) Araceæ. S. foliage plant. Petioles 10–12 in. long. Blade of l. spreading 6–12 in. long, 5–9 in. broad, ovate-hastate, dark green, variegated between the nerves with whitish, the variegation resembling in pattern the tips of fern fronds, with their tips directed towards the base of the midrib. Congo.

Nerine Moorei, Max. Leichtlin. (*G. C.* 1886, v. 26, p. 681.) Amaryllidaceæ. G. bulb with slightly twisted, thick, blunt l., 9–12 in. long, and an umbel of 6–9 bright scarlet fl., with crisped, oblanceolate segments, 1¼ in. long.

Nesopanax vitiensis, Seem. (*Gfl.* 1887, p. 71.) Araliaceæ. S. A small tree, with long-stalked, large, digitate l.

having 6–10 obovate, bluntly-pointed leaflets, attenuated at their base into long stalks. Umbels compound, 9–12 in. in diameter; fl. green. Fiji.

Nidularium Makoyanum, Rgl. (*Gfl.* 1887, p. 656.) Bromeliaceæ. S. epiphyte in the way of *N. spectabile*, differing in the l. being green on both sides, obscurely white-banded beneath; the bracts green, narrow linear-lanceolate; and the pet. free to the base, whitish, slightly violet towards the acuminate tips. Trop. America.

Notylia Bungerothii, Rchb. f. (*G. C.* 1887., v. 2, p. 38.) Orchideæ. Bulbs large, broadly oblong, rugose. L. broadly cuneate-oblong. Fl. small, yellowish-green, in long dense racemes. Tropical America, Venezuela?

Nymphæa flava, Leitn. (*B. M.* t. 6917; *R. H.* 1887, p. 192.) Nymphæaceæ. G. on S. aquatic, with a cylindric rootstock, round l., sinnate on the margin, deeply notched at base; and pale yellow fl. 4 in. in diam. Florida.

Nymphæa kewensis, Watson. (*G. C.* 1887, v. 2, p. 366.) Garden hybrid.

Nymphæa tuberosa, var. **flavescens**, Oliver. (*G. C.* 1887, v. 2, p. 366.) H.? aquatic, with a long stout rhizome producing numerous tubers, l. like those of N. alba, and fl. 4–6 in. in diam., of a creamy-white with bright yellow stamens.

Nymphæa zanzibarensis, var. **fl. rubro**, Sib. (*Gfl.* 1887, p. 83, t. 1240.) S. A var. with deep rose-purple fl.

Octomeria supraglauca, Rolfe. (*G. C.* 1887, v. 2. p. 716.) Orchideæ. A small tufted species about 2 in. high, with elliptic fleshy l., whitish green above, dark green, obscurely tessellated with dark purple beneath, and minutely furrowed. Peduncles 2–3 flowered. Fl. ¾ in. long, pale glassy-green, faintly tinted with purplish outside, and a yellowish lip marked with a large lurid purple blotch. Sep. and pet. lanceolate acuminate, lip one-fourth as long, obtuse.

Odontoglossum Alexandræ, var. **Cutsemianum**, Linden. (*L.* v. 2. p. 47, pl. 70.) Orchideæ. See **O. crispum**, var. **Cutsemianum**.

Odontoglossum Andersonianum, var. **splendens**, Williams. (*W. O. A.* vol. 7, pl. 292; *G. C.* 1887, v. 2, p. 220.) See **O. crispum**, var. **splendens**.

Odontoglossum bictonense, var. **roseum**, Veitch. (*Veitch Man. Odont.*, p. 13.) This is probably a synonym of the var. **rubrum**. The sep. and pet. are brown and the lip deep rose.

—— Var. **speciosum**, Rgl. (*Gfl.* 1887, p. 346, t. 1250, f. c–d.) A var. with dark-purple sep. and pet., transversely marked with yellow, and a rosy-purple lip.

—— Var. **sulphureum**, Veitch. (*Veitch Man. Odont.*, p. 13.) A var. with yellow sep. and pet., and a white lip.

Odontoglossum blandum, var. **Rossianum**, Rchb. f. (*G. C.* 1886, v. 26, p. 712.) A nice variety having the sep. and pet. spotted with brown, the base of the lip yellow with red spots, the blade of the lip spotted and streaked with purple, and the crests yellow.

Odontoglossum Cervantesii, var. **roseum**, Veitch. (*Veitch Man. Odont.*, p. 16.) A form with pale rose-coloured fl.

Odontoglossum citrosmum, var. **album**, Veitch. (*Veitch Man. Odont.*, p. 19.) This has pure white fl. with a yellow crest to the lip.

—— Var. **punctatum**, Veitch, (*Veitch Man. Odont.*, p. 19.) Has pale rose-coloured fl. dotted with purple on the seps. and pet.

—— Var. **roseum**, Veitch, (*Veitch Man. Odont.*, p. 19.) A form with a deep rose-coloured blade to the lip.

Odontoglossum constrictum, var. **pallens**, Rchb. f. (*G. C.* 1886, v. 26, p. 648.) A form with sulphur-coloured sep. and pet., and a whitish lip with a very light yellowish hue.

—— Var. **Sanderianum**, Veitch. (*Veitch Man. Odont.*, p. 20.) A reduction to the rank of variety of the *O. Sanderianum*, Rchb. f.

Odontoglossum Coradinei, var. **grandiflorum**, Rchb., f. (*L.* v. 2, p. 93; *G. C.* 1887, v. 2, p. 108.) A handsome large-flowered form of **O. Lindleyanum**, var. **Coradinei**, having light-yellow fl. blotched and spotted with chestnut-brown. New Granada. See p. 113.

Odontoglossum coronarium, var. **chiriquense**, Veitch. (*Veitch Man. Odont.*, p. 23.) A var. having rather larger and paler fl. than the type. Sep. chestnut-brown; pet. yellow with some brown markings; lip yellow with a brown blotch on the disk. Chiriqui. Syn. *O. chiriquense*, Rchb. f.

—— var. **miniatum**, Veitch. (*Veitch Man. Odont.*, p. 23.) A form with the bulbs placed more closely together, and a denser inflorescence and smaller fl. Sep. and pet. chestnut-brown, bordered with yellow; lip yellow. Ecuador. Syn. *O. miniatum* of gardens.

Odontoglossum crispum, var. **Andersonianum**, Veitch. (*Veitch Man. Odont.* p. 25 and 26, with fig.) Syn. *O. Andersonianum*, Rchb. f.

—— Var. **angustatum**, Veitch. (*Veitch Man. Odont.*, p. 25). A form of the *Andersonianum* var., with narrower and more pointed fl.-segments, and larger blotches on the pet.

—— Var. **apiatum**, Ballantine. (*Veitch Man. Odont.*, p. 27; *G. C.* 1886, v. 25, p. 568.) A var. stained with violet-purple on the sep., and all the segments marked with one large and two smaller brown blotches.

—— Var. **Chestertoni**, Rchb. f. (*Veitch Man. Odont.*, p. 26.) A var. with broad sep. and pet., white, with two large, and one small reddish-brown blotch on the sep., and 2–5 spots on the pet. Lip reddish-brown, with a broad yellowish-white margin.

—— Var. **Cutsemianum**, N. E. Br. A large-flowered form, with broad toothed pet., white, spotted with red. Syn. *O. Alexandræ*, var. *Cutsemianum*, Linden.

—— Var. **Edithiæ**, N. E. Br. A var. with yellow fl. blotched with brown, the sep. suffused with rose, and the pet. with white centres. Columbia. Syn. *O. Edithiæ*, Warner.

—— Var. **fastuosum**, Linden. (*L.*, v. 3, p. 41, pl. 115.) A distinct and handsome form, with broad rosy-purple sep. and pet., and a white lip spotted with purple-brown.

—— Var. **Hrubyanum**, Rchb. f. (R. vol. 1, p. 65, t. 29.) A large-flowered var. in which the whole of the central area of the very broad sep. and pet. is occupied with a brown blotch. Columbia.

—— Var. **hyperxanthum**, Rchb. f. (*G. C.* 1887, v. 1, p. 477.) A variety having white sep. and pet. and a yellow lip, the sep. also being marked with a few yellow spots; no purple spots.

—— Var. **Jenningsianum**, Veitch. (*Veitch Man. Odont.*, p. 26.) Syn. *O. Jenningsianum*, Rchb. f.

—— Var. **limbatum**, Veitch. (*Veitch Man. Odont.*, p. 26.) Syn. *O. limbatum* Rchb. f.

—— Var. **lobatum**, Veitch. (*Veitch Man. Odont.*, p. 25.) Syn. *O. Andersonianum* var. *lobatum*, Rchb. f.

—— Var. **Pollettianum**, N. E. Br. A var. with the sep. and pet. tinted with purple, and margined with creamy white; they are much spotted with reddish-brown, and the lip has a brown blotch on the middle. New Granada. Syn. *O. Pollettianum*, Williams.

—— Var. **reginæ**, Philbrick. (*W. O. A.*, v. 6, pl. 264.) A form with white fl. evenly spotted with reddish-brown, the disk of the lip being yellow. New Grenada.

—— Var. **Ruckerianum**, Veitch. (*Veitch Man. Odont.*, p. 27, with fig.) Syn. *O. Ruckerianum*, Rchb. f.

—— Var. **splendens**, N. E. Br. A var. with white fl., tinged with rose, and marked on the sep. with a large brown blotch in the centre and several smaller spots at the base, the base of the pet. spotted with brown, and the lip with a large central brown blotch and some small spots of the same colour on each side of the base, which is yellow with some radiating dark red lines. Columbia. Syn. *O. Andersonianum*, var. *splendens*, Williams.

—— Var. **tenue**. (*Veitch Man. Odont.*, p. 25.) Syn. *O. Andersonianum*, var. *tenue*, Rchb. f.

—— Var. **Wolstenholmiæ**, Rchb. f. (*G. C.* 1887, v. 2, p. 98.) A var. with large ochre-brown spots and mauve borders to the sep. and pet., and a brown disk to the lip, which has yellow crests.

Odontoglossum cristatum, var. **cristatellum**, Veitch. (*Veitch Man. Odont.*, p. 32.) Syn. *O. cristatellum*, Rchb. f.

Odontoglossum Edithiæ, Warner. (*W. S. O. P.*, ser. 3, pl. 25.) See **O. crispum**, var. **Edithiæ**.

Odontoglossum euastrum, Rchb. f. (*G. C.* 1887, v. 2, p. 71.) A handsome species allied to *O. Brassia*, with white fl. marked with mauve and brown stripes and spots on the sep., and some brown spots on the lip, which is rather heart shaped at the base and toothletted, abruptly contracted into a long lanceolate front lobe, crests brown, the disk around them sulphur-coloured.

Odontoglossum eugenes, Veitch. (*Veitch Man. Odont.*, p. 73.) A handsome species resembling *O. Pescatorei* in foliage, and *O. triumphans* in infl. Sep. pale yellow with brown blotches, usually arranged in three groups. Pet. with a broad pale yellow margin, and the base and centre white with some brown spots. Lip like that of *O. triumphans*, with a crest similar to that of *O. Pescatorei*. Columbia.

Odontoglossum gracile, Lindl. (*Veitch Man. Odont.*, p. 74.) A distinct-looking species, easily recognised by the peculiar blackish tinge of the bulbs, leaves, and peduncle, which is paniculately branched, the branches bearing

2–3 reddish-brown fl., about 1 in. in diam., having two whitish crests on the fleshy lip. Ecuador.

Odontoglossum grande, var. **Williamsianum**, Veitch. (*Veitch Man. Odont.* p. 33.) Syn. *O. Williamsianum*, Rchb. f.

Odontoglossum Harryanum, Rchb., f. (*G. C.* 1886, v. 26, p. 486, and 1887, v. 2, p. 168–9, f. 41. *Veitch Man. Odont.*, p. 37, with fig.) A very distinct species with racemes of large handsome fl. Sep. rather broad, ligulate-oblong, acute, wavy, brown with yellow bars and margin. Pet. rather narrower, wavy, with yellow recurved points, base white with elongated mauve blotches, above the middle brown with yellow margin and apex. Lip with a narrow basal part angled on each side, which is yellowish with mauve borders and lines; and a broad, pandurate blade, abruptly contracted into an ovate acute point, white at first, changing to yellow, striped with mauve-purple and having a yellow frimbriate crest.

Odontoglossum hinnus, Rchb. f. (*G. C.* 1887, v. 1, p. 606.) A curious-looking species, with narrow lanceolate, wavy sep. and pet., and a narrow acuminate lip, all the parts are yellow and brown.

Odontoglossum histrionicum, Rchb. f. (*G. C.* 1887, v. 1, p. 512.) A fine form with elongate sep. and pet. of a whitish-ochre, bordered and spotted with brown, the pet. are wavy and toothed. Lip very broad, rhomboid acuminate, toothed and angled, broken on the upper half so as to appear cordate, yellow blotched and marked with brown.

Odontoglossum Lindleyanum, var. **Coradinei**, Veitch. (Veitch Man. Odont., p. 43.) Syn. *O. Coradinei*, Rchb. f. and var. *grandiflorum*, Rchb. f., see p. 111.

—— Var. **ligulare**, Veitch. (*Veitch Man. Odont.*, p. 43.) Syn. *O. ligulare*, Rchb. f.

—— Var. **mirandum**, Veitch. (*Veitch Man. Odont.*, p. 43.) Syn. *O. mirandum*, Rchb. f.

Odontoglossum Lucianianum, Rchb, f. (*Ill. H.* v. 34, p. 23, pl. 7; *L.* v. 2, p. 37, pl. 65; *G. C.* 1886, v. 26, p. 712.) Something in the way of *O. nævium* and *O. odoratum*, with a fine raceme of white fl. spotted on the lanceolate acuminate sep. and pet. with reddish-brown, and having a semilunate blotch of the same on the basal part of the ovate acuminate lip. Venezuela.

Odontoglossum luteopurpureum, var. **cuspidatum**, Veitch. (*Veitch Man. Odont.* p. 45.) Syn. *O. cuspidatum*, Rchb. f.

—— Var **facetum**, Veitch. (*Veitch Man. Odont*, p. 45.) Syn. *O. facetum*, Rchb. f., and *O. prænitens*, of gardens.

—— Var. **Hinnus**, Veitch. (*Veitch Man. Odont.*, p. 46.) Syn. *O. Hinnus*, Rchb. f.

—— Var. **magnificum**, Williams and Moore. (*W. A. O.*, v. 6, pl. 254.) A large-flowered var. with the sep. entirely chestnut-brown except the apex and base, and the pet. and lips heavily blotched with chestnut-brown. New Grenada. Syn. *O. hystrix* var. *magnificum* of gardens.

—— Var. **Mulus**, Veitch. (*Veitch Man. Odont.*, p. 46.) Synonyms *O. Mulus*, Rchb. f. and *O. histrionicum* Rchb. f.

—— Var. **Vuylstekeanum**, Veitch. (*Veitch Man Odont.*, p. 47.) Syn. *O. Vuylstekeanum*, Rchb. f.

Odontoglossum lyroglossum, Rchb., f. (*R.* vol. 1, p. 65, with fig.) Something in the way of *O. Pescatorei*, with yellow fl. blotched with brown. Sep. oblong acute, the lateral ones falcate. Pet. elliptic acute. Lip panduriform, the front part reniform and very obtuse, crest consisting of two falcate keels with a smaller one between them, and several short radiating keels behind them. Columbia?

Odontoglossum nebulosum, var. **candidissimum**, Veitch. (*Veitch Man. Odont.*, p. 53.) This is probably the same as the var. **candidum.** Fl. without spots.

Odontoglossum odoratum, var. **baphicanthum**, Veitch. (*Veitch Man. Odont.*, p, 55.) Syn. *O. baphicanthum*, Rchb. f.

—— Var. **hebraicum**, Veitch. (*Veitch Man. Odont.*, p. 56.) Syn. *O. hebraicum*, Rchb. f.

—— Var. **Leeanum**, Veitch. (*Veitch Man. Odont.*, p. 56.) Syn. *O. Leeanum*, Rchb. f.

Odontoglossum Pescatorei, var. **Germinyanum**, Williams. (*W. O. A.* v. 7, pl. 305. *G. C.* 1887, v. 2, p. 788.) A handsome var. with white fl. flushed with light rosy-purple on the sep., and marked with a few rose-purple spots, chiefly on the midline of the sep., and one at the apex of the pet. The lip is white, with the basal part broadly margined with purple around a yellow disk, which has some radiating purple lines on it, and a figured blotch in front, there are also a few purple spots on the front lobe.

—— Var. **leucoxanthum**, Rchb. f. (*G. C.* 1887, v. 1, p. 606, f. 114.) A variety with pure white fl., only marked with orange on the crests and column.

—— Var. **stupendum**, Rchb. f. (*G. C.* 1887, v. 2, p. 186.) A large-flowered var. with the disk of upper sep., outer halves of lateral sep., and some spots on the pet, and lines on the lip mauve-purple.

Odontoglossum Pollettianum, Williams. (*W. O. A.* v. 6, pl. 280.) See **O. crispum** var. **Pollettianum.**

Odontoglossum polyxanthum var. **grandiflorum**, Williams. (*W. O. A.* v. 6, pl. 258.) A fine large-flowered var., with deep yellow sep. and pet., the former marked with a few large brown blotches, the latter with smaller blotches confined to the base. Lip chocolate-brown, edged with whitish, and with a yellow base. Ecuador.

Odontoglossum ramosissimum, var. **liliiflorum**, Veitch. (*Veitch Man. Odont.*, p. 63.) A robust var. with larger fl. of a pale rose-purple, marked with some white ocellated spots on the basal part of the sep. and pet., which are less wavy than in the type. New Granada.

Odontoglossum rhynchanthum, Rchb. f. (*G. C.* 1887, v. 1, p. 380.) Something in the way of *O. Lindleyanum.* Raceme lax, sep. and pet. ligulate acute, yellow, with a brown line and a few brown spots at base of pet. Lip with a narrow acuminate front lobe, keels 2 or 4, no bristles.

Odontoglossum Rosii, Lindl. The following are made varieties of this in *Veitch Man. Odont.*, p. 65:—

—— Var. **aspersum**, Veitch. Syn. *O. aspersum*, Rchb. f.

—— Var. **cœrulescens**, Veitch. Syn. *O. cœrulescens*, A. Rich.

—— Var. **Ehrenbergii**, Veitch. Syns. *O. Dawsonianum*, Rchb. f., and *O. Ehrenbergii*, Lindl.

—— Var. **Humeanum**, Veitch. Syn. *O. Humeanum*, Rchb. f.

—— Var. **majus**, Carrière. (*R. H.* 1886, p. 492, with pl.) This is the same as the var. **rubescens**, Veitch.

—— Var. **rubescens**, Veitch. Syn. *O. rubescens*, Lindl.

—— Var. **Smeeanum**, Rchb. f. (*G. C.* 1887, v. 1, p. 799.) A fine variety, with a brown sep., marked with a few whitish dots; white pet., with a brown disk and base; and a white lip with a yellow crest.

—— Var. **virescens**, Veitch. A var. with white fl. spotted with green.

—— Var. **Warnerianum**, Veitch. Syn. *O. Warnerianum*, Rchb. f.

Odontoglossum Schillerianum, Rchb. f. (*L.* v. 2, p. 71, pl. 82; *G. C.* 1887, v. 1, p. 646.) Rather a showy species with compressed oblong bulbs, bearing one strap-shaped acute l. convolute at the base. Racemes erect, about a ft. high, several flowered. Sep. and pet. oblong-lanceolate acute, yellow, blotched with chocolate. Lip with very small tooth-like side lobes, and a cordate-ovate acute front lobe, with two keels on the disk; base white, the front part chocolate with a yellow margin. Venezuela.

Odontoglossum Schroederianum, Rchb. f. (*G. C.* 1887, v. 2, p. 364.) The plant here described is **Miltonia Clowesii**, and not at all the same as *O. Schroederianum* described by Prof. Reichenbach in *G. C.* 1882, v. 17, p. 700, which I am informed on competent authority is but a form of **O. crispum.**

Odontoglossum staurastrum, Rchb. f. (*G. C.* 1887, v. 1, p. 313.) Very similar to *O. Lindleyanum*, but sep. and pet. broader, light yellowish-green, blotched with brown. Lip white, with dark brown on the front lobe, and some mauve stripes between the keels, and some spots on the sides of the stalk. Columbia.

Odontoglossum stauroides, var. **Gravesianum**, Rchb. f. (*G. C.* 1887, v. 2, p. 154.) A form with ochre-sulphur sep. and pet. marked with a few spots and some lines and dots of purple-brown at the base, and a white lip with the centre and some lines and spots at the base purple-brown, crests yellow.

Odontoglossum tripudians, var. **leucoglossum**, Veitch. (*Veitch. Man. Odont.*, p. 67.) A var. with the ground colour of the lip white.

—— Var. **xanthoglossum**, Veitch. (*Veitch. Man. Odont.*, p. 67.) Has the ground colour of the lip canary-yellow.

Oncidium Braunii, Rgl. (*Gfl.* 1886, p. 621, t. 1235, f. a–c; *R. H.* 1887, p. 144.) Orchideæ. Bulbs compressed, ovoid. L. solitary, ovate-oblong, subacute. Panicle narrow, raceme-like, with very short 2–3-flowered branches. Fl. small, yellow marked with brown on the sep. pet. and basal half of the lip. Sep. oblong reflexed, the lateral ones connate at base. Pet. ovate-oblong. Lip pandurate, bilobed, with a many-tubercled crest, pubescent at the base.

Oncidium hastatum, var. **hemimelænum,** Rchb. f. (*G. C.* 1887, v. 2, p. 127.) A var. with blackish-purple sep. and pet.; tipped, and occasionally spotted on the pet. with whitish-green.

Oncidium Hookeri, Rolfe. (*G. C.* 1887, v. 2, p. 520.) A new name for the plant figured in the Botanical Magazine, t. 3712, as *O. raniferum*, var. *major.* It differs from *O. raniferum* in having the lateral sep. united for half their length. Brazil.

Oncidium Jonesianum, var. **phæanthum,** Rchb. f. (*R.* v. 1, p. 47, t. 21.) A var. with brownish sep. and pet., a smaller crest on the lip, and no spots. Paraguay.

Oncidium lutescens, Rchb. f. (*G. C.* 1887, v. 1, p. 799.) Allied to *O. metallicum,* differing in the long, wavy, dorsal sep., the 3-toothed crest of the lip, and acute column-wings. Dorsal sep. dark brown with yellow recurved margin, lateral sep. greenish-brown; pet. very short, auricled, hastate-triangular, wavy, dark brown with yellow edge; lip oblong, short, dark greenish at the angled base, purple on the front part.

Oncidium stelligerum, var. **Ernesti,** Williams. (*W. O. A.*, v. 6, pl. 260; *G. C.* 1887, v. 1, p. 15.) A var. with pale yellow fl. with large rounded brown spots on the sep. and pet., and a reddish-purple front lobe to the lip. Mexico.

Oncidium tigrinum, var. **lugens,** Rchb. f. (*G. C.* 1886, v. 26, p. 553.) A variety with the sep. and pet. of a uniform dark reddish-brown inside, the tips being yellow and the dorsal keels green.

Oplismenus Burmanni, var. **albidulum,** N. E. Br. (*G. C.* 1886, v. 26, p. 776.) Gramineæ. G. or S. A pretty little grass of dwarfer and more compact habit than the common variegated form (*Panicum variegatum* of gardens), having the l. mostly white, with a green stripe along the midrib. India.

Onnithidum ochraceum, Rchb. f. (*G. C.* 1887, v. 1, p. 209.) Orchideæ. An unattractive plant, with distant, elliptic, two-edged bulbs on an ascending stem, bearing one apical and one basal cuneate-oblong unequally acute l. Fl. few and very small; sep. and pet. ochreous with a few purple spots lip white with the disk of front lobe ochre, dotted with mauve. New Granada.

Ostrowskia magnifica, Rgl. (*Gfl.* 1887, p. 638, f. 160.) Campanulaceæ. H. A very handsome and distinct per. 4–5 ft. high, with whorls of large lanceolate acute-toothed l., and a terminal raceme of large, long-stalked, erect blue fl. Calyx with a series of linear pores at the base of the long, linear, acute segments. Corolla campanulate, 3 in. long and as much in breadth. Central Asia.

Oxalis catharinensis, N. E. Br. (*G. C.* 1887, v. 1, p. 140.) Geraniaceæ. G. A distinct species with a scaly rhizome; l. with three triangular leaflets, truncate at apex with rounded angles and a very slight notch in the middle. Peduncles 4–15 flowered; fl. white with very narrow cuneate-oblong pet. Santa Catharina.

Oxalis imbricata, E. and Z., double-flowered form. (*G. C.* 1887, v. 2, p. 681, f. 129.) G. A bulbous species with hairy l. ½ in. in diam., having three broadly obcordate leaflets, which often overlap each other. Peduncles hairy 3–4 in. high, bearing one double rose pink fl. S. Africa.

Oxera pulchella, Lab. (*B. M.* t. 6938; *G. C.* 1886, v. 26, p. 786; and 1887, v. 2, p. 108.) Verbenaceæ. S. A handsome free flowering climber of striking appearance, quite glabrous. L. opposite 2–5 in. long, lanceolate obtusely pointed, entire, or with large crenations, bright green. Fl. large and showy, 2 in. long, funnel-shaped, with oblong lobes, greenish-white, pendulous in several flowered axillary cymes, stamens 2, much exserted, with two short rudimentary ones between them. New Caledonia.

Panax fruticosum, var. **multifidum,** N. E. Br. (*G. C.* 1887, v. 1, p. 544; *Veitch Cat.*, p. 11.) Araliaceæ. S. decorative shr. A form having a compact plumose crown of tripinnatisect l., with linear or linear-lanceolate segments ¼–½ in. long, tipped with a short white bristle, and often with bristle tipped teeth on their margins.

Pandanus Augustianus, Lind. and Rod. (*Ill. H.* v. 33, p. 157, pl. 612.) Pandaneæ. S. foliage plant, allied to P. Kerchovei, but with a taller stem, and broader and more densely toothed l., with green denticulate nerves. New Guinea.

Pandanus Grusonianus, Lind. and Rod. (*Ill. H.* v. 34, p. 35, pl. 12.) S. screw-pine allied to P. Kerchovei, with numerous linear l. 3 ft. long, ¾–1 in. broad, densely serrated with red spines. Admiralty Isles.

Panicum italicum, var. **japonicum**. (*Gfl.* 1887, p. 278, f. 72.) Gramineæ. H. Garden var. of **Setaria italica**.

Paphinia Lindeniana, Rchb. f. (*L.* v. 3, p. 23, pl. 106.) Orchideæ. A handsome species with oblong-ovoid bulbs 2–2½ in. long, elliptic acute l., and racemes of large showy fl. Sep. and pet. lanceolate acuminate, the central part dark red-purple (broken up into lines and spots on the sep.), the margin white. Lip white with a dark purple-brown base, the front lobe hastate, with numerous filiform and papillate crests. Oronoco.

Papperitzia Leiboldi, Rchb. f. (*G. C.* 1886, v. 26, p. 680,) Orchideæ. A small orchid of botanical interest. L. 2–3 in. long, linear acuminate. Racemes lax, pendulous. Fl. small, green with yellow bristles on the sep. and pet., and some yellow on the lip. Dorsal sep. conic-gibberose with a tail-like apex; lateral sep. connate, compressed, back nearly square, apex aristate. Pet. oblong, aristate-acuminate. Lip connate with the base of column forming a blunt pouch at the base, hairy inside, and closed by a high three-toothed crest, in front of which, on the base of the oblong or cuneate blade of the lip, is another tumour-like crest.

Passiflora Watsoniana, Masters. (*G. C.* 1886, v. 26, p. 648, f. 126–127; *Gfl.* 1887, p. 340.) Passifloraceæ. G. climber, with 3-lobed l., about 2–2½ in. long by 3 in. broad, green above, violet beneath. Fl. about 3 in. in diam. Sep. narrow-oblong, horned at apex, green, with whitish margin outside, white, flushed with violet inside. Pet. similar to sep. delicate lilac. Corona of several rows of erect threads, the outer rows twice as long as the inner, violet barred with white. Brazil ?

Passiflora Weberiana, André. (*R. H.* 1887, p. 324, with pl.) S. climber, with 3-lobed acute l., cordate at base, toothed on the margin. Fl. small, whitish, violaceous outside. Fr. small, oblong, bluish-violet, covered with small tubercles. Andes of Bolivia.

Peristeria læta, Rchb. f. (*G. C.* 1887, v. 2, p. 616.) Orchideæ. Something in the way of *P. cerina*. Bulbs narrow, light green. L. long, narrow, and thin. Fl. bright yellow, sep. and pet. with dark purple spots; lip paler, dotted with indian-purple.

Peristeria selligera, Rchb. f. (*G. C.* 1887, v. 2, p. 272.) Orchideæ. Very similar to *P. pendula*, but with an armless column, and a saddle-shaped crest to the lip. Demerara.

Phaius Sedenianus, Rchb. f. (*G. C.* 1887, v. 1, p. 174.) Orchideæ. Garden hybrid.

Phalænopsis alcicornis, Rchb. f. (*G. C.* 1887, v. 1, p. 799.) Orchideæ. Something in the way of *P. grandiflora*. L. silvery green. Sep. and pet. creamy white, the sep. light yellowish outside. Lip white with yellow spots on the lobed crests, nail of the lip, side lobes, and keel of the nearly cross-shaped front lobe.

Phalænopsis Rothschildiana, Rchb. f. (*G. C.* 1887, v. 1, p. 606.) Garden hybrid.

Phalænopsis Foerstermanii. (*G. C.* 1887, v. 1, p. 244.) A small but pretty species, with cuneate-obovate, unequally bidentate l. Peduncle two-edged. Fl. small, white, with some brown lines on the cuneate-lanceolate sep. and pet. Lateral lobes of lip with a retrorse bristle and an oblique keel outside, and a yellow callus on the inner side of each; front lobe 3-toothed, with an erect fringed crest.

Phalænopsis Harriettæ, Rolfe. (*G. C.* 1887, v. 2, p. 8, f. 1.) Garden hybrid. Syn. *P. violacea-amabilis*. Rolfe.

Phalænopsis Luddemanniana, var. **heiroglyphica**, Rchb. f. (*G. C.* 1887, v. 2, p. 586.) A var. with rather narnow somewhat erect l., and narrower ochreous-white sep. and pet. marked with brown circles or spots. The lip has very short side lobes, and a narrow cuneate front lobe, with a strong keel at the base and very few hairs at the convex top. Philippines.

Phalænopsis Regnieriana, Rchb. f. (*G. C.* 1887, v. 2, p. 746.) Allied to *P. antennifera*, with very thick acute l., and racemes of rose-coloured fl. with a dark purple lip, which has small triangular side lobes, and a larger oblong-lanceolate, apiculate front lobe, much thickened underneath, the filiform processes are represented by small white teeth, and there is also a small three-lobed white crest. Siam.

Phœnix rupicola, var. **foliis argenteo variegatis**. (*Ill. H.* v. 34, p. 10, pl. 3.) Palmæ. S. A var. having the l. variegated with white. Garden variety.

Phytolacca decandra, var. **albo-variegata**, Carrière. (*R. H.* 1887, p. 16, f. 2.) Phytolacceæ, H. per. L. variegated. Garden variety.

Picea alpestris, Brugg. (*Gfl.* 1887, p. 346.) Coniferæ. H. tree. Much in the way of P. excelsa, but having the young shoots velvetty, with stiffer, shorter, and thicker l., about ½–¾ in. long, and more distinctly 4-angled. Swiss Alps.

Picea excelsa, var. **virgata**, Caspary. (*Gfl.* 1887, p. 521, f. 128.) Coniferæ. H. tree. A synonym of **Abies excelsa**, var. **monstrosa**, Loud.

Pinus austriaca, var. **foliis aureis.** (*Gfl.* 1887, p. 643.) H. tree. Garden variety.

Pinus koraiensis, var. **variegata,** Carrière. (*R. H.* 1887, p. 83.) H. Garden variety.

Piptanthus tomentosus, Franchet. (*R. H.* 1887, p. 474.) Leguminosæ. H. shr., somewhat resembling *P. nepalensis*, but clothed with a silky tomentum in all parts. Yunnan, China.

Pitcairnia Roezli, Morr. (*B. H.* v. 35, p. 285, pl. 18–19.) Bromeliaceæ. An ornamental Bromeliad, with lax tufts of broadly linear acuminate l., about 2 ft. long, with smooth edges, and very mealy beneath, and a fl.-stem about as long as the l., bright red, having green bracts with a cobwebby tomentum. The fl. are about 2½ in. long, and of a bright scarlet-red colour, arranged in a dense raceme. Organ Mountains, Brazil.

Pittosporum rhytidocarpum, A. Gr. (*Gfl.* 1887, p. 130.) Pittosporeæ. G. shr. with obovate or oblanceolate, shortly acuminate l., and terminal crowded umbels of white fl. A very pretty and useful decorative plant. Fiji.

Platanus occidentalis, var. **foliis argenteis,** Späth. (*R. H.* 1887, p. 64.) Plataneæ. H. tree. Garden variety.

Plerandra Græffei, no doubt a misprint for **P. Grayi,** Seem. (*Gfl.* 1887, p. 71.) Araliaceæ. S. A small robust tree, with dark green digitate l., having 8–10 leaflets. Fiji.

Pleurothallis insignis, Rolfe. (*G. C.* 1887, v. 1, p. 477, B. M. t. 6936.) Orchideæ. A very striking species, with oblong leathery l., 3–3½ in. long, 1 in. broad; peduncles 2-flowered, 2½ in. long; and fl. 2½ in. long, of a whitish pellucid green, striped with dull purple, lip dark blackish-purple, villose at the apex. Venezuela ?

Pleurothallis maculatus, N. E. Br. An insignificant species, with very short stems, elliptic obtuse fleshy l., 1½–2¼ ins. broad, spotted with purple, and numerous minute yellow fl. spotted with crimson, the sep. united at their base and apex. Brazil ? Syn. *Cryptophoranthus maculatus,* Rolfe.

Pleurothallis picta, Lindl. (*G. C.* 1887, v. 2, p. 431.) A pretty little species, with a dense tuft of l. about 2 in. high, and racemes of small bright yellow and red fl. Demerara.

Pleurothallis tribuloides, Lindl. (*G. C.* 1887, v. 2, p. 335.) An inconspicuous species about 2 in. high, with numerous, very small, brick-red fl. Jamaica.

Podocytisus caramanicus, Boiss. (*R. H.* 1887, p. 63.) See **Laburnum caramanicum.**

Pogogyne nudiuscula, Gray. (*Gfl.* 1887, p. 113, t. 1242; *G. C.* 1887, v. 1, p. 447.) Labiatæ. H. A pretty annual 9–12 in. high, with slender puberulent branches, narrow, obtuse, glabrous l., and whorls of bright blue fl. about ½ in. long. California.

Polemonium cœruleum, var. **Himalayanum,** Baker. (*G. C.* 1887, v. 1, p. 766.) Polemoniaceæ. H. per. A var. with the inflorescence hairy, and fl. much larger than in the typical form, the corolla being 1½ in. in diam., lilac-blue. Himalaya.

Polemonium flavum, Greene. (*B. M.* t. 6965.) H. per. A distinct species 2–3 ft. high, loosely tomentose in the upper part. L. pinnate, with lanceolate segments. Cymes corymbose or panicled. Fl. light yellow, 1 in. in diam. New Mexico.

Polyscias paniculata, Baker. (*G. C.* 1887, v. 2, p. 366.) Araliaceæ. The corrected name for the S. shr. grown as *Terminalia elegans* in gardens.

Populus Eugenii, Simon. (*Gfl.* 1887, p. 674; *G. C.* 1887, v. 2, p. 818.) Salicineæ. H. tree. Garden variety of **P. canadensis.** Syn. *P. pyramidalis var. Meetensis.*

Pothos argenteus, Bull. (*Bull Cat.*, p. 11.) Araceæ. S. foliage plant of climbing habit, with obliquely ovate-acuminate l., of a silvery-grey, with the margin and a band along the mid-rib deep green. Borneo.

Pothos nitens, Bull. (*Bull Cat.*, p. 11.) S. climber with ovate acute l., obliquely cordate at base, of a dark, shining, bronzy-purplish green. Malay Archipelago.

Primula blattariformis, Franchet. (*G. C.* 1887, v. 1, p. 575.) Primulaceæ. H. per. A distinct and handsome species, clothed with short papilliform hairs, with ovate or obovate, deeply crenate, and crested l., and a raceme, 8–12 in. long, bearing numerous scattered lilac fl. with broadly obcordate lobes. Yunnan.

Primula capitata, var. (*B. M.* t. 6916, f. B.) H. H. A var. with a looser head of much larger violet-purple fl. Sikkim.

Primula obtusifolia, Royle var. (*B. M.* t. 6956; *G. C.* 1887, v. 2, p. 341.) H. A beautiful alpine primrose, with stalked, oblong, obtuse, glabrous, irregularly toothed l., and umbels of deep claret-purple fl., with blackish-brown calyces. Sikkim. N.B. —The above is not the typical form of the species.

Primula sapphirina, Hook. fl. and Th. (*B. M.* t. 6961 A.; *G. C.* 1887, v. 2, p. 21.) H. A diminutive but elegant little species, 1½–3 in. high, with a rosette of spathulate, coarsely toothed l., ½–¾ in. long, and few-flowered umbels of nodding purple fl., about ⅓ in. in diam. Sikkim.

Primula Venzoi. (*G. C.* 1887, v. 1, p. 320.) H. Garden hybrid.

Primula vinciflora, Franchet. (*G. C.* 1887, v. 1, p. 575 f. 108.) H. per. A fine and distinct species, with cuneate-oblong ciliate l., covered with reddish sessile glands. Scape hairy, bearing one large Vinca-like, purple-violet fl., 1½ in. in diam, with a long pubescent tube, swollen at the base. Yunnan.

Pritchardia Thurstoni, Mull. and Dr. (*Gfl.* 1887, p. 486–489, f. 123 and 124, 1–8; *G. C.* 1887, v. 2, p. 341; *R. H.* 1887, p. 459.) Palmæ. S. A fine Palm with a tall stem crowned with a dense tuft of large fan-shaped, palmatisect l., from the axils of which arise the slender fl.-stems, which are longer than the l., and bear a compact panicle of fl. at their apex. Fiji.

Prunus Japonica, var. **sphærica,** Carrière. (*R. H.* 1887, p. 136.) Rosaceæ. H. shr. Garden variety.

Pseudophœnix Sargenti, Wendl. (*R. H.* 1887, p. 34.) Palmæ. S. Palm growing to 25 ft. in height, with pinnate l. 4½ ft. long, having lanceolate acuminate leaflets 12–16 in. long, glaucous beneath. Spadix panicled, about a yard long and broad. Berries ¾ in. in diam. bright orange or red. Florida.

Psychotria sulphurea, Seem. (*Gfl.* 1887, p. 130.) Rubiaceæ. S. A profuse and continuous flowering, small, climbing shr., with shining green l., and clusters of Centranthus-like bright blue fl., and sulphur-yellow berries. Fiji.

Ptelea trifoliata, var. **aurea,** Behnch. (*R. H.* 1886, p. 547.) Rutaceæ. H. tree. Garden variety.

Pteris cristata, var. **nana,** Carrière. (*R. H.* 1887, p. 90.) Filices. A garden var. of **P. serrulata.**

Pteris tremula, var. **grandiceps,** Bull. (*G. C.* 1886, v. 26, p. 757; *Bull Cat.*, p. 11.) G. Garden hybrid.

Pyrethrum Decaisneanum, Maxim. and P. **marginatum,** Miq. (*R. H.* 1887, p. 185.) See **Chrysanthemum.**

Quercus sessiliflora, var. **pendula,** Carrière. (*R. H.* 1887, p. 61.) Cupuliferæ. H. tree with pendulous branches. Garden variety.

Restrepia pandurata, Rchb. f. (*G. C.* 1887, v. 1, p. 244.) Orchideæ. An elegant species similar to R. guttulata, but larger, with a pandurate lip, having a transversely oblong front lobe, covered with warts and hairy, whitish with purple-brown spots.

Rhapis Kwamwonzick, Sieb. (*Ill. H.* v. 34, p. 39., pl. 13.) Palmæ. A slender S. Palm, growing to about 4–5 ft. high with leafy stems. Petioles unarmed. L. palmately divided into 4–7 lanceolate segments. Japan?

Rhododendron albescens, Bull. (*Bull Cat.*, p. 11.) Ericaceæ. G. Garden variety.

Rhodendron balsaminæflorum, vars. **album** and **aureum,** Veitch. (*Veitch Cat.*, p. 12, and 6 and 7 with fig.) Garden hybrids.

Rhododendron grande, var. **roseum,** Hook, f. (*B. M.* t. 6948.) G. A variation in which a plant with whitish fl., suddenly produced deep red fl. Sikkim.

Rhododendron graveolens, Bull. (*Bull Cat.*, p. 11.) G. Garden hybrid.

Rhododendron ledifolium, var. **plena purpurea,** Regel. (*Gfl* 1886, p. 565, t. 1233, f. c–d; *R. H.* 1887, p. 143.) H. shr. Garden variety.

Rhododendron Victorianum, Cuvelier. (*G. C.* 1887, v. 1, p. 387.) Garden hybrid.

Rhododendron yedoense, Maxim. (*Gfl.* 1886, p. 565, t. 1233, f. a–b.) H. shr. The l. first produced are lanceolate, shortly acuminate, with adpressed hairs, the autumnal l. smaller, linear-spathulate, broadly petiolate, deep green. Umbels 3-flowered; calyx-lobes linear-oblong, acute, serrate, setose; corolla funnel-shaped, rose-pink. Japan.

Ricinus cambodgensis, Benary. (*Gfl.* 1887, p. 102.) Euphorbiaceæ. H. H. Probably a form of **R. communis,** with large l., and blackish stem and branches.

Robinia pseudo-acacia, var. **monophylla,** May. (*R. H.* 1887, p. 287.) Leguminosæ. H. tree. Garden variety.

Romulea Macowani, Baker. (*G. C.* 1887, v. 1, p. 184 and 180, f. 42.) Iridaceæ. G. A beautiful little bulb with linear-curved l., and crocus-like fl., 1–1½ in. in diam., which are bright golden yellow in the lower part, lighter upwards, and often tinged with red at the tips. S. Africa.

Rosa platyphylla, Red. (*R. H.* 1886, p. 436.) Rosaceæ. H. A broad-leaved form of *R. multiflora,* Thbg.

Rubus americanus of gardens is a name given by nurserymen to the old **R. villosus,** Ait. (see *G. C.* 1887, v. 2, p. 99.)

Saccolabium Pechei, Rchb. f. (*G. C.* 1887, v. 1, p. 447.) Orchideæ. L. 7 in. long, 2 in. broad, oblong, obtusely bilobed. Raceme few-flowered, fl. as large as those of *S. bellinum.* Sep. and pet. cuneate-oblong, subacute, ochreous with red spots. Lip with a cupular spur, retuse side lobes, and a transversely triangular front lobe; the base is yellow with a few red spots, the front lobe whitish. Moulmein.

Saccolabium Smeeanum, Rchb. f. (*G. C.* 1887, v. 2, p. 214.) L. very thick, with acute edges, obtuse and unequally 2-lobed at apex. Racemes dense. Fl. small, whitish with mauve mid-veins to the sep. and pet., and a mauve disk to the white lip, which latter fades to yellow and brown, the sep. and pet. fading to whitish ochre with mauve-brownish stripes. Sep. and pet. oblong. Side lobes of lip very small, oblong, midlobe oblong, acute, with a swelling under the apex. Spur short, cylindric.

Salix californica of gardens. (*Gfl.* 1887, p. 606 and 644.) Salicineæ. A var. of **S. repens,** said to be an ornamental willow for mingling with other plants.

Salix lasiandra, var. **lancifolia,** Bebb. (*Gfl.* 1887, p. 410, and 409 f. 98.) H. tree, with lanceolate acuminate l., 6–10 in. long, finely serrate on the margin; reniform stipules, and greenish-yellow catkins about 2 in. long, on short lateral shoots. California.

Sanseviera aurea variegata, Williams. (*Williams' Cat.*, p. 23.) Liliaceæ. S. A distinct-looking plant with thick, leathery, oblong-obovate l., pale green in the centre, with two broad bands of creamy white, and a narrow pale green margin.

Saxifraga media, var. **Friderici-Augusti.** (*G. C.* 1887, v. 1, p. 47.) Saxifragaceæ. H. Alpine plant of very dwarf tufted habit, with small rosettes of narrow lanceolate bright green l., and numerous yellowish fl. on short leafy stalks. Dalmatia.

Schizanthus Grahami, var. **lilacinus.** (*Gfl.* 1887, p. 665, f. 169.) Scrophulariaceæ. G. Garden variety.

Schizocasia Regnieri, Lind. and Rod. (*Ill. H.* v. 34, p. 17, pl. 6; *G. C.* 1887, v. 1, p. 421.) Araceæ. S. foliage plant, much like *S. Portei* in general appearance. Petioles pale yellowish-green, irregularly banded with rosy. Blade of l. sagittate, pinnatifid, dark green, with pale whitish-green midrib and nerves. Siam.

Schomburgkia Humboldtii, Rchb. f. (*Veitch Man. Cattl. and Lælia*, p. 101.) Orchideæ. A handsome species with fl. somewhat like those of a Lælia. Bulbs tapering, 6–8 in. long, furrowed. L. 2 to 3, oblong, leathery, 6 in. long. Fl.-stem 3–4 ft. long, paniculate. Fl. 2½–3 in. in diam. Sep. and pet. wavy, pale lilac, the pet. tinted with purple towards the apex. Lip with triangular, amethyst-purple side lobes, and a bilobed, fringed and crisped front lobe, of a bright purple streaked with paler; disk yellow, with 5–7 keels, purple towards their base. Venezuela.

Schomburgkia marginata, var. **immargiata,** Rchb. f. (*G. C.* 1887, v. 1, p. 447,) A variety with brown wavy sep. and pet. without a yellow margin; lip and column white.

Schomburgkia Thomsoniana, Rchb. f. (*G. C.* 1887, v. 2, p. 38; *Veitch Man. Cattl. and Lælia,* p. 102.) Similar to *S. tibicinis,* but smaller. Sep., light yellow, with the central part outside light mauve, with whitish dots. Pet. light sulphur, with dark purple marks on the mid-line outside. Lip with rounded, angulate side lobes, and a wavy oblong front lobe, obscurely 3-keeled, blackish-purple, with a white area near the apex, and some yellow on the front part of the keels. Syn. *Bletia Thomsoniana,* Rchb. f.

Sciadopitys verticillata, var. **variegata,** Carrière. (*R. H.* 1887, p. 83.) Coniferæ. H. Garden variety.

Scilla lingulata, Poir. (*Gfl.* 1887, p. 625, t. 1261, p. 2–4ᵇ.) Liliaceæ. H. bulb. A pretty little species with lanceolate l., and racemes of starlike blue fl. Var. **lilacina** (f. 3) has lilac-blue fl. Var. **alba** (f. 4*a* and 4*b*) has white fl. Algeria, Morocco.

Scolopendrium officinale, var. **Valloisii.** Carrière (*R. H.* 1886, p. 447, f. 114.) Filices. H. A strong growing var. with the fronds dilated and irregularly divided and crested at their summit, forming large bunch-like tufts.

Selaginella tassellata, Bull. (*Bull Cat.* p. 11 and 3 with fig.) Lycopodiaceæ. S. An elegant species with a creeping caudex, from which arise gracefully arching, bipinnately branched stems, the branchlets ending in drooping slender spikes. Brazil.

Silphium albiflorum, A. Gr. (*B. M.* t. 6918; *R. H.* 1887, p. 192.) Compositæ. An ornamental H. per., 2–4 ft. high, scabrid. L. pinnatisect. Heads in the axils of the upper stem l., radiate 3½ in. in diam., creamy white. Texas.

Sobralia leucoxantha, Rchb. f. (*W. O. A.* v. 6, pl. 271.) Orchideæ. A beautiful species with lanceolate, acuminate, plicate l., and large white fl., with the throat and disk of the lip deep yellow, marked with orange-red lines in the tube. Costa Rica.

Sobralia xantholeuca, Williams. (*W. O. A.* v. 6, pl. 250.) A distinct and showy species, with broad, lanceolate, acute, plicate, dark green l., and very large fl., with spreading sulphur-yellow sep. and pet. and a large, crumpled, lemon-yellow lip, with a deeper yellow throat striped with orange-red.

Solanum Wendlandii, Hook. f. (*B. M.* t. 6914; *R. H.* 1887, p. 192.) Solanaceæ. S. A handsome climbing shr. with prickles on the stem and petioles. L. variable, 2–10 in. long, 1½–4 in. broad, entire, and oblong acuminate with cordate base, or 3-lobed, pinnatifid, or pinnate. Fl. in large terminal cynes, pale-lilac purple, 2-2½ in. diam. Costa Rica.

Sophrocattleya Batemanniana, Rolfe. (*Journ. Linn. Soc.* v. 24, p. 156; *Veitch Man. Cattl. and Lælia,* p. 92, with fig.) A synonym of **Lælia Batemaniana,** Rchb. f.

Sophronitis grandiflora, var. **aurantiaca,** Carrière. (*R. H.* 1886, p. 492, with pl.) Orchideæ. A var. with dark orange-red fl.

—— Var. **purpurea,** Veitch, and var. **rosea,** Veitch. (*Veitch Man. Cattl. and Lælia,* p. 106.) The first named var. is the *S. purpurea,* Rchb. f., and the second is similar, but with bright rosy-purple fl.

Spathiglottis Regnieri, Rchb. f. (*G. C.* 1887, v. 1, p. 174.) Orchideæ. Allied to *S. Lobbii,* but with broader l., and smaller light yellow fl., having the side lobes shorter and broader, the callus, which is white with brown spots, stands more backwards, and there are no cilia on the basal angles of the long stalk. Cochin China.

Staphylea Coulombieri, André. (*R. H.* 1887, p. 462.) Sapindaceæ H. tree. Garden variety.

Statice superba, Rgl. (*Gfl.* 1887, p. 666, f. 170.) Plumbagineæ. H. annual resembling *S. Suworowi,* but with the spikes densely crowded into a pyramidal panicle.

Stellera Alberti, Rgl. (*Gfl.* 1887, p. 649, t. 1262.) Thymeleæ. H. shr., 1–2 ft. high, much branched. L. oblanceolate, obtuse, cuneate at the base, subsessile, glabrous, or the young ones minutely silky-pilose. Fl. in pedunculate heads, small, yellow. Central Asia.

Strelitzia regina, var. **citrina.** (*G. C.* 1887, v. 2, p. 816.) Scitamineæ. S. A. var. with citron-yellow sep. S. Africa.

Streptocarpus Dunnii, Hook. f. (*B. M.* t. 6903; *G. C.* 1886, v. 26, p. 625; and 1887, v. 1, p. 804; *R. H.* 1886, p. 557; and 1887, p. 166.) Gesneraceæ. G. or S. A fine and exceedingly floriferous species, with a single very large l., growing to 2 or 3 ft. long, and numerous many-flowered cymes of tubular red fl. Transvaal.

Streptocarpus kewensis, N. E. Br. (*G. C.* 1887, v. 2, p. 137, and 246, f. 61; R. H. 1887, p. 391.) G. Garden hybrid.

Streptocarpus Watsoni, N. E. Br. (*G. C.* 1887, v. 2, p. 137, and 215, f. 52.) G. Garden hybrid.

Strobilanthes attenuatus, Jacq. (*Gfl.* 1887, p. 177, t. 1243.) Acanthaceæ. G. A handsome shr. with petiolate, ovate, acuminate, serrate, dark green l., and loose panicles of violet-blue fl., marked with a yellow spot in the throat. Himalaya.

Strobilanthes coloratus, T. And. (*B. M.* t. 6922.) S. shr., glabrous. L. 5–7 in long, ovate acuminate, toothed, dark green above, purple beneath. Fl. in lax panicles, pale lilac-purple, ¾ in. in diam., with a swollen, nearly straight tube. Eastern Himalaya.

Strobilanthes flaccidifolius, Nees. (*B. M.* t. 6947; *G. C.* 1887, v. 2, p. 109.) S. A pretty shr., yielding a blue dye. L. 2–4 in. long, elliptic-lanceolate acute, narrowed into a petiole, serrate, glabrous, bright green. Fl. in loose leafy, paniculate spikes, lilac-purple; the tube of the corolla is bent, and the lobes deeply notched. India, China.

Strophanthas Ledienii, Stein. (*Gfl.* 1887, p 145, t. 1241; *G. C.* 1887, v. 1, p. 447.) Apocyneæ. S. shr. of interesting character, with deciduous, opposite, obovate, cuspidate, subsessile, rubescent l., and terminal umbels of yellow fl. with a purple throat, appearing when the plant is bare of l. Pedicels ¾ in. long, and as well as the calyx, green. Corolla funnel-shaped, the spreading lobes with linear tails 4½–5 in. long. Congo.

Swainsonia atrococcinea, Carrière. (*R. H.* 1887, p. 275.) Leguminosæ. G. Garden variety.

Swainsonia Ferrandi, var. **alba,** Carrière. (*R. H.* 1886, p. 562.) G. Garden variety.

Syringa emodi, var. **aurea,** Behnch. (*R. H.* 1886, p. 547.) Oleaceæ. H. shr. Garden variety.

—— Var. **foliis variegatis,** Simon-Louis. (*R. H.* 1886, p. 547.) Garden variety.

Tapeinanthus humilis, Cav. (*G. C.* 1887, v. 2, p. 53.) Amaryllideæ. H. A small bulb, having a filiform l., and solitary yellow fl., ¾ in. in diam., on a very slender scape 2–3 in. high. The perianth is cut to the base into narrow obovate segments with a small scale at their base. Spain, Tangiers.

Tecoma Ricasoliana, Tanfani. (*Bullet. Soc. Tosc. di Orticult.*, 1887, p. 17, t. 1–2.) Bignoniaceæ. G. or S. climber. A handsome species. L. pinnate, leaflets ovate, acute, toothed. Fl. in terminal panicles, corolla with a somewhat inflated, or narrowly funnel-shaped tube, and spreading limb, delicate rose-pink, veined with darker. S. Africa. Syn. *T. Mackenii*, Watson. (*G. C.* 1887, v. 1, p. 215.)

Thrixspermum unguiculatum, Rchb. f. (*W. O. A.* v. 6, pl. 266.) Orchideæ. This, which is also known as *Phalænopsis Ruckerinana* in gardens, is a synomyn of **Sarcochilus unguiculatus,** Ldl.

Thunbergia affinis, S. Moore. (*G. C.* 1887, v. 2, p. 460–1, f. 94.) Acanthaceæ. S. A handsome shr. with shortly stalked, ovate or ovate-lanceolate, bright green l., and solitary fl. 2 in. in diam., of a dark purple-blue, with a yellow throat. Zanzibar.

Tillandsia chrysostachys, Baker. (*B. M.* t. 6906; *R. H.* 1887, p. 166.) Bromeliaceæ. Syn. *Vriesia chrysostachys,* Morren.

Tillandsia fenestralis, Hook. f. (*B.M.* t. 6898.) Syn. *Vriesia fenestralis,* Lind. and André.

Tillandsia inflata, Wawra. (*R. H.* 1887, p. 44.) The corrected name for *Vriesia psittacina*, var. *Truffautiana*, Andrè.

Tillandsia reticulata, Baker. (*G. C.* 1887, v. 1, p. 140.) This is the plant also known in gardens as *Guzmannia reticulata* and *Vriesia reticulata*.

Tillandsia vestita, Cham. and Schl. (*G. C.* 1887, v. 1, p. 670.) One of the broad-spiked group. Stem short. L. not crowded, linear-subulate, 5–6 in. long, ¼ in. broad, channelled, clothed with white scales. Fl.-stem 6 in. high, fl. in a simple distchous spike, yellow, with bright red glabrous bracts. Mexico.

Torenia Fournieri, var. **compacta,** Gump. (*Gfl.* 1887, p. 667, f. 172.) Scrophulariaceæ. S. Garden variety.

Tournefortia cordifolia, Andre. (*R. H.* 1887, p. 128, f. 26, 27.) Boragineæ. G. or H. H. Shr. of bold habit, clothed with short hairs. L. opposite, growing to a ft. in length, cordate, acute, on petioles 3–4 in. long. Fl. small, white, in large terminal corymbose cymes. Trop. America.

Trichocentrum albo-purpureum, var. **striatum,** Linden. (*L.* v. 2, p. 77, pl. 85; *G. C.* 1887, v. 2, p. 108.) Orchideæ. A var. having a large purple blotch on each side of the base of the lip, and the apical part striped with the same colour.

Tridax bicolor, var. **rosea,** A. Gr. (*G. C.* 1887, v 2, p. 428, and p. 553, f. 108.) Compositæ. H. A pretty annual of dwarf habit, with stalked ovate l., slightly glandular hairy, and long-stalked heads 1½ in. in diam., with a rosy-lilac ray and yellow disk. Mexico.

Tulipa linifolia, Rgl. (*Gfl.* 1886, p. 622, t. 1235, f. d-f; *R. H.* 1887, p. 144.) Liliaceæ. H. bulb. A small species, with about three linear-lanceolate, wavy, acute l., and a bright scarlet-red fl. about 2 ins. in diam., marked with a black spot at the base of the obovate obtuse segments. Central Asia.

Ulmus campestris, var. **Berardi,** Carrière. (*R. H.* 1887, p. 63.) Ulmaceæ. H. tree. Garden variety.

Urginea eriospermoides, Baker. (*G. C.* 1887, v. 2, p. 126.) Liliaceæ. G. bulb of botanical interest, with two cylindrical, glossy l., ⅛-in. in diam.; and a fl.-stem 2 ft. high, with a raceme of small whitish fl. S. Africa.

Urginea macrocentra, Baker. (*G. C.* 1887, v. 1, p. 702.) G. bulb of botanical interest. Bulb globose 2–3 ins. in diam. Leaf solitary, terete, erect 1½ ft. long. Fl. stem 3 ft. high, stout, with a dense raceme of ascending, campanulate, white fl., tipped with green; the lowest bracts with a curious convolute spur ¾-in. long. S. Africa.

Ursinia pulchra, N. E. Br. (*G. C.* 1887, v. 1, p. 670.) Compositæ. H. annual. This is merely the familiar *Sphenogyne speciosa* of gardens, now referred to the genus **Ursinia.** S. Africa.

Vanda Amesiana, Rchb. f. (*G.C.* 1887, v. 1, p. 764; and v. 2, p. 472; *W. O. A.* v. 7, pl. 296.) Orchideæ. A charming species, having a short stem with l. like those of Aerides affine, and a long inflorescence of scented, creamy white fl., with a rosy hue. Sep. and pet. cuneate oblong, subacute. Side lobes of lip small, nearly square, front lobe reniform, two-lobed, with 3 raised lines on the disk in front of a small transverse rounded tubercle. Spur conical, compressed, short. India.

Vanda Clarkei, N. E. Br. (*Esmeralda Clarkei*, Rchb. f. *G. C.* 1886, v. 26, p. 552.) Much in the way of *V. Cathcarti*, with cuneate, oblong, obtuse sep. and pet., of a dark brown barred with ochre, yellow outside; the lateral sep. and pet. curved. Lip 3-lobed, with a conical acute spur, whitish, with brown border and areas between the keels, and some brown stripes on the side lobes. Front lobe cordate, oblong - elliptic, with a rough lobulate border, and 7–9 radiating whitish keels. Mouth of spur covered by two retrorse crests, with another crest in front. Himalaya.

Vanda Dearei, Rchb. f. (*G. C.* 1886, v. 26, p. 6 48. *Gfl.* 1887, p. 340.) A fine species allied to *V. tricolor*, with yellow fl. L. very acute, bidentate at apex, 1½ in. broad, yellowish-green. Sep. and pet., shortly stalked, elliptic obtuse. Lip with small squarish side lobes, and a broad, transverse, pandurate front lobe, the spur is conical and has a short, rounded, grooved crest over the front of its mouth. Sunda Isles.

Vanda Sanderiana, var. **albata,** Rchb. f. (*G. C.* 1887, v. 2, p. 9.) A variety with white upper sep. and pet. marked with a few purple spots at base, lateral sep. with the middle and outer side suffused with pale yellow and veined and spotted with red; lip pale yellow, marked with brownish-purple at the base, and brownish-yellow at the base of the front lobe, which is sometimes striped with purple.

Venidium fugax, Harv. (*G. C.* 1887, v. 2, p. 333.) Compositæ. H. annual, 1–1½ ft. high, clothed with short hairs. Radical l. stalked, elliptic, more or less sinuate or lobed, upper l. sessile, entire or slightly sinuate-toothed. Heads 1½ in. in diam., bright orange with a blackish disk. Syn. *V. calendulaceum* of gardens. S. Africa.

Venidium hirsutum, Harv. (*G. C.* 1887, v. 2, p. 332.) H. annual a foot high, clothed with soft hairs. Radical l. lyrate-pinnatifid, stalked, the upper ones sessile, oblong-lanceolate, pinnatifid. Heads 1½–1¾ in. in diam., bright orange-yellow with a blackish disk. Syn. *V. speciosum* of gardens. S. Africa.

Viçia Dennesiana, Wats. (*B. M.* t. 6967.) Leguminosæ. H. H. per. climber, of great interest, on account of its being extinct in a wild state. L. pinnate ending in branched tendrils. Racemes rather dense. Buds purple, changing to slaty-blue, and on expansion to a dingy fawn colour. Azores.

Vitis capensis, Thunb. (*R. H.* 1887, p. 372, with pl.) Ampelideæ. G. A trailing species, with reniform, obtusely angled and sinuate-toothed l., and short cymes of tomentose fl., followed by depressed-globose blackish-red berries. S. Africa.

Xanthorrhæa Preissii, Endl. (*B. M.* t. 6933.) Juncaceæ. G. One of the remarkable "Grass-trees," with a stout trunk, long, quadrangular, slender l., and a fl.-stem 1–8 ft. long, bearing a dense spike of about the same length, of greenish-yellow fl. S. W. Australia.

Zea gracillima, var. **variegata.** (*Gfl.* 1886, p. 640.) Gramineæ. Garden variety of the Maize.

Zinnia linearis, Bth. (*Gfl.* 1887, p. 667, f. 171.) Compositæ. H. annual. A beautiful species 12–18 in. high, branching from the base, with opposite, linear, or linear-lanceolate l., and solitary radiate heads of a bright deep orange colour, about 1 in. in diam. Mexico.

Zizania aquatica, L. (*Gfl.* 1886, p. 551.) Gramineæ. H. A tall aquatic grass, with broad, lanceolate acuminate l., and a large paniculate inflorescence. N. America.

Zygocolax Veitchii, Rolfe. (*G. C.* 1887, v. 1, p. 765.) See **Zygopetalum Veitchii.**

Zygopetalum Crepeauxi, Carrière. (*R. H.* 1887, p. 420.) Orchideæ. A robust, tufted species, with small angular bulbs, and shortly-stalked elliptic-ovate l. Fl. rather crowded, showy; sep. and pet. dark red spotted and striped with yellow; lip large, white with violet lines on the margin, and the nerves covered with short violet-rose hairs. Brazil.

Zygopetalum Veitchii, Veitch. (*G. C.* 1887, v. 1, p. 425.) Garden hybrid. Syn. *Zygocolax Veitchii*, Rolfe.

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ROYAL GARDENS, KEW.

BULLETIN
OF
MISCELLANEOUS INFORMATION.

No. 17.] MAY. [1888.

XL.—IPECACUANHA.

(*Cephaelis Ipecacuanha*, Rich.)

The ipecacuanha plant is a half-shrubby perennial not more than 18 inches high, which grows in abundance under the shade of trees in the hot, moist forests of many parts of Brazil. It was cultivated in this country at Edinburgh at least as early as 1832, and flowered at Glasgow in 1843.

The part used in medicine is the dried roots. These are collected more or less all the year round, but less during the rainy season from the difficulty of drying them properly. As stated by Bentley and Trimen (Medicinal Plants, vol. ii., 145), "From its stimulant action " on the alimentary canal ipecacuanha has always been in repute as a " remedy in chronic dysentery and diarrhœa, and in large doses of 30 " grains and upwards it is regarded in India as almost a specific in " acute dysentery."

For the last quarter of a century a persistent attempt has been made to introduce the ipecacuanha plant into India. This has met with the

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY EYRE AND SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.

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1888.

Price Twopence.

most varied fortune, and has at last been crowned with success in the Straits Settlements. It is evident that the problem presented was one of no ordinary difficulty. The ipecacuanha plant presents very little elasticity of constitution, and refuses to flourish, except under a very limited range of physical conditions. The result of experiment has, however, been to show that it can be propagated by extraordinary facility, whether by ordinary cuttings, by cuttings of the roots, or even by merely pegging a leaf to the earth.

The history of the introduction of the ipecacuanha plant into India may be commenced with the following extracts from a letter addressed by Dr. Anderson, Superintendent of the Botanical Gardens, Calcutta, to the Under Secretary to the Government of Bengal, dated December 8th, 1868:—

"My attention had been directed to the introduction of the ipecacuanha plant into the Botanical Gardens of Calcutta for some years, "but I was unable to procure any plants until April 1866, when one "plant was sent to me by the overland route by Dr. Hooker, Director "of the Royal Gardens, Kew.* I am indebted to the care bestowed "on the plant by Dr. George King, Assistant Surgeon of the Bengal "Medical Service, during the voyage to India for its having arrived in "Calcutta in good health." * * *

"The plant of ipecacuanha originally introduced into the Botanical "Gardens in 1866 is dead; but I now possess nine plants in this "garden, which have been artificially propagated from the original "one, besides five growing at the cinchona plantations at Darjeeling, "to which place I sent one last year. I have thus 14 plants of "ipecacuanha."

On March 23, 1869, the India Office wrote to Kew requesting that some plants of ipecacuanha may be procured and sent with care to Bombay.

Sir Joseph Hooker replied, March 19: "I can place two healthy "plants at the disposal of his Excellency the Governor in Council at "Bombay, and I hope soon to be able to supply more, but the plant "(of which but one has been imported alive) is still excessively rare "and propagated but slowly."

These two plants were taken out by Mr. Henry Gayen from Southampton on May 10. The India Office wrote to Kew December 9th following, stating that "the two plants had perished after their arrival in India."

On March 28, 1870, Dr. Anderson, who had in the meantime come to England, reported to the India Office: "The plants have thriven at "Calcutta and at the lowest levels of the cinchona plantations in "Sikkim, and also at Ootacamund. There were 20 plants at Calcutta "and Darjeeling last November, all the produce of one plant I received in 1866, and 13 at Ootacamund on the 9th of November last, "the produce of three plants obtained by Mr. McIvor from Kew in "1866–67. These four original plants are the only ones from which "cuttings have been made in India, all others having perished on the "voyage, or soon after reaching the country."

Acting on instructions from the Government of India, Dr. Anderson stated that he "determined to obtain as many plants of *Cephaelis*

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* It is impossible now to ascertain the exact history of this plant, but it is believed that it was part of a direct importation from Brazil.

"*Ipecacuanha* as possible from botanical and private gardens in Britain and Europe." He continues: "I communicated first with Dr. Balfour, Professor of Botany in the University of Edinburgh, and both he and Mr. McNab, the Curator of the Botanical Gardens there, promised to propagate as many cuttings of ipecacuanha for transmission to India as could be safely taken from the two old plants in the Edinburgh garden. It was when examining these old plants, in order that the best method of propagating might be determined on, that it occurred to Mr. McNab that the numerous root-like tubers might be taken advantage of as a means of rapidly increasing the plants. I saw the first crop of these rhizomes taken off without causing the slightest injury to the plant, and before I left Edinburgh I had the satisfaction of seeing that many of these rhizomes had struck root, and sent up a strong shoot. I heard lately that a considerable number of young plants had been obtained in the Edinburgh Botanical Gardens by means of this root division, and that many more would be procured as the roots are reproduced, all of which are intended for India. I may mention that the two old plants of *Cephaelis Ipecacuanha* have been many years in Edinburgh, and they are by far the largest and finest I have seen. In addition to these young plants promised by Dr. Balfour from the Edinburgh Botanical Gardens, I procured from Messrs. Lawson and Sons, of Edinburgh, four large plants of *Cephaelis Ipecacuanha*, which I have left in their charge for propagation. * * * There are seven young plants of *Cephaelis Ipecacuanha* in the Royal Gardens, Kew, and the greater proportion of these and all the cuttings that can be obtained from them will be available for transmission to India, along with the stock I may obtain from other sources. I have also procured another large plant of Ipecacuanha in London, from which cuttings will be made, both of the roots and stems, during the remainder of my leave in England. I have heard of a few more large plants in nurseries and private gardens, some of which I shall be able to purchase or obtain in exchange for seeds or plants from the Calcutta Botanic Gardens. Cuttings will be got from these in private gardens and will be rooted and grown in Kew.

"I estimate that I shall be able to take out in January, 1871, not less than 50 plants of the true ipecacuanba, all of which will have been obtained in Europe, principally in exchange for rare plants and seeds from the Botanical Gardens, Calcutta."

Dr. Anderson was, unfortunately, never able to carry out his plans. He suffered from severe illness and died before his return to India. He was succeeded in the charge of the Royal Botanic Garden, Calcutta, by Dr. King, the present superintendent, who reported May 14, 1872, to the Government of Bengal :—

"At the beginning of the year (1871) the total stock of ipecacuanha amounted to five plants in Sikkim and seven in this garden. These represented the only surviving offspring of a single plant received from Dr. Hooker in 1866. The five plants in Sikkim were early in the present year submitted by Messrs. Gammie, Biermann, and Jaffrey, of the cinchona plantation, to a most successful experiment in artificial propagation, by which about 400 cuttings were obtained, the greater proportion of which have formed good roots, and are now fine healthy little plants. * * * Five Wardian cases containing about 100 plants were received from Dr. Balfour, of the Royal Botanical Garden, and three cases from Messrs. Lawson. In

" accordance with the orders of the Government of India, based on " the results of the experience of the late Dr. Anderson, these plants " were forwarded to Sikkim as soon as practicable after their arrival " here. The Calcutta climate having proved totally unsuitable to this " plant, all attempts to propagate it in this garden have been abandoned, " and the cultivation of ipecacuanha has been accepted like that of " cinchona as an experiment which must form an outlying charge. The " plants are at present under the immediate care of the European " gardeners of the cinchona plantation, and propagation is being carried " on chiefly in one of the hot, deep valleys on the outer slopes of the " Sikkim Himalaya, which open towards the terai. * * * Hitherto " the plant has not perfected seed in this country, although flowers " have frequently been produced; we must therefore look to increase " by cuttings and other artificial methods."

From the report of Dr. George Henderson, officiating Superintendent of the Royal Botanical Gardens, Calcutta, to the Government of Bengal, May 31, 1873, it appears that the number of plants from Edinburgh which reached Rungbee alive up to the end of March, 1872, were 258. In 1872 and 1873 122 other plants were received, making a total of 380. Besides these Dr. Anderson took out to India in December, 1873, 128 plants from Kew and Calcutta. In the summer of 1871 he reported: "We partially stripped the plants of their roots, which we cut " into very small pieces and treated as ordinary cuttings. By this " method our stock of plants and cuttings was increased to about 300 " by the end of August, 1871." By a continuation of the method the total number of plants on the 1st of January 1873 was 3,066, and on March 31 6,719 in Sikkim and 500 in Calcutta.

On April 28, 1874, Dr. King reported that this amount had increased to 63,423. He states: "The cultivation has been practically confined " to Sikkim, where it has been conducted chiefly by Mr. Jaffrey of the " cinchona establishment, to whom is largely due the credit of its " success. * * * Until the mode of propagating this plant by " root and leaf cuttings was discovered progress was extremely slow. " Since this discovery it has been proportionately rapid. * * * " Mr. Gammie, the resident manager of the cinchona plantation, and I " quite agree that the ipecacuanha cannot be successfully cultivated in " Sikkim except in shady places. In open spots where it gets the full " sun it soon becomes sickly. It is essentially a tropical plant and " evidently prefers moist, shady spots where there is much vegetable " mould in the soil, and an equable steamy atmosphere. * * * " A few plants had been sent during the year to the Khasi Hills, " and 100 are about to be despatched to the Madras Government for " trial in the garden at Barliar, a low-lying, moist spot in one of the " valleys of the Nilgiris."

June 4, 1875, Dr. King reports: "The propagation of the plant by " root-cuttings is now thoroughly understood, and there are in the hot- " beds, under Mr. Jaffrey's care, at Rungbee more than 100,000 young " plants, while two years ago there were less than 7,000."

On June 7th, 1876, Dr. King further reported to the Government of Bengal: "During the year I supplied a quantity of the drug itself " (the dried root) to the Surgeon-General for trial in hospital practice. " This was carefully administered in cases of dysentery by Dr. Crombie, " late officiating physician to the Medical College Hospital, and was " pronounced by him to be quite as efficient as the best South American " drug." On July 10th, 1878: "A number of plants have been sent " to the Botanical Garden at Singapore, which enjoys a climate that

" ought to suit ipecacuanha perfectly. * * * We have been per-
" fectly successful in propagating the plant from root-cuttings and seed,
" and it grows luxuriantly under cover. But out of doors the low night
" temperature of the cold weather proves too severe for it. During the
" year 26 pounds of the dried root, taken from plants grown in frames,
" under Mr. Jaffrey's care at Rungbee, were sent to the medical depôt
" for use, previous trials having established the excellence of the
" Sikkim-grown drug." Again, July 10th, 1879: "I have been
" obliged to give up all hope of the profitable cultivation of the drug
" in Northern India, the climate being unsuitable."

Here its official history in this part of India closes. But the following extract from a letter addressed to Kew by Mr. Gammie, the resident manager of the Government Cinchona Plantations at Darjeeling, November 11th, 1886, illustrates in a striking way the varied fortune which attends the attempt to introduce a plant to new physical conditions in a part of the world distant from its original home, and the impossibility of absolutely forecasting the event of the experiment even under the most discouraging circumstances :—

"I do not think I ever told you the final results from our ipecacuanha
" growing experiments, but do so now.

"Our original stock of plants came from Kew and Edinburgh; the
" great majority from Edinburgh. The few plants from Kew differed
" a good deal in appearance from the Edinburgh lot, which again
" differed greatly from each other. All the Kew plants were of one
" sort, which we named from the start the Kew variety. It was
" rougher in the leaf than the Edinburgh sorts, and not so strong
" growing while under glass.

"After we had satisfied ourselves that we could make nothing of
" ipecacuanha from a commercial point of view, we put all the plants
" out in the open, under shade, and let them take their chance. By
" this time we had all the sorts mixed up together, and as we had,
" originally at least, ten Edinburgh plants for each one of the Kew
" sort, and the Edinburgh lot had, besides, been much the stronger
" growers under glass, the Kew plants formed less than five per cent.
" of the whole. But very soon the Edinburgh sorts began to dis-
" appear, until, in the course of a year or two, there was not a single
" plant of one of the Edinburgh varieties alive, whilst almost every
" plant of the Kew variety lived. Of it, at the present moment, we
" have a good stock, and in one place, at 1,400 feet elevation, under
" the shade of living trees, we have plants which were put out many
" years ago in the most perfect health, but, unfortunately, their growth
" has been so slow as to render the prospect of any profitable return
" from them almost hopeless. Still it strikes me that in places geo-
" graphically better situated for ipecacuanha growing than Sikkim,
" that this particular variety may succeed although other sorts may
" have failed. Probably our ipecacuanha experiments may prove
" another instance of the folly of giving up the cultivation of new
" crops as hopeless until the most exhaustive experiments have been
" carried out. It may be that there are even hardier varieties of
" ipecacuanha than the 'Kew variety' to be found."

Dr. King's prediction in 1878, that the climate of Singapore would be found well adapted to ipecacuanha, has been abundantly verified, as will be seen from Mr. Cantley's report on the Forest Department of the Straits Settlements for 1886, dated July 4, 1887, p. 20 :—

"Ipecacuanha (*Cephaelis Ipecacuanha*), a native of Brazil, and a
" plant which has been found generally very difficult to cultivate, seems

" to grow in the Straits with all the luxuriance of its native country " when a proper situation is hit upon. It enjoys a very moist, still " atmosphere, and somewhat dense shade. In the Straits it forms a " compact little bush of about 18 inches in height and is very ornamental when well in flower. I lately visited a plantation of the plant " in Johore, and saw thousands of plants in excellent health. They " were protected from the sun by palm leaves laid side by side on " artificial supports about 6 feet in height; hedges of the same material " were put down a few yards apart. Soil, chocolate colour, rich in " vegetable matter, wood ashes, &c."

There can be little doubt that Johore was the source of the consignment of ipecacuanha which found its way into the London market at the latter end of 1887. This was the first commercial sample of the drug produced in the old world. It was at first supposed to be of Indian origin, and a report upon its examination is given by Mr. Francis Ransom in the Journal of the Pharmaceutical Society for November 12th, 1887, p. 400. He found 1·7 per cent. of emetine in the root, the average strength of the Brazilian drug being 1·66 per cent. He concludes, therefore, that " the Indian [so-called] cultivated ipecacuanha is " quite equal to the average Brazilian root."

Nothing is known of the history of the plant grown in the Johore plantation. It is, however, probable that they were derived from Sikkim, though four plants were sent from Kew to Singapore in 1875.

XLI.—BRAZILIAN GUM ARABIC.

The following correspondence has passed between this establishment and the Foreign Office on the subject of Brazilian gum arabic :—

Royal Gardens, Kew, to Foreign Office.

Sir, Royal Gardens, Kew, February 6, 1888.

I am desired by Mr. Thiselton Dyer to inform you that owing to the interruption of commerce in the Soudan the price of "gum arabic" has risen so considerably that efforts are being made to obtain gum of a similar character from other countries.

2. Recently about 537 packages of gum, weighing about 50 tons, have arrived in this country from Pará. Samples of this gum have been presented to the museums of the Royal Gardens by Messrs. Brookes and Green, Mincing Lane, E.C.

3. As the botanical origin of this gum is unknown Mr. Thiselton Dyer would be glad if the Secretary of State would approve of the co-operation of Her Majesty's Consul at Pará being sought to obtain for Kew dried specimens of the leaves, flowers, and fruit of the tree or trees from which the gum is obtained.

4. It would be useful also to receive any information the Consul may be able to gather as regards collecting the gum locally and the expenses which are incurred up to the time the gum is shipped at Pará.

I have, &c.

Sir Thos. Villiers Lister, K.C.M.G. (Signed) D. Morris.

CONSUL KANTHACK, PARÁ, to ROYAL GARDENS, KEW.

SIR, British Consulate, Pará, April 3, 1888.

I HAVE the honour to acknowledge the receipt of your letter of the 8th of February and a copy of your Despatch dated the 6th of February last past to Her Majesty's Principal Secretary of State for Foreign Affairs, and in reply I have the honour to inform you that the gum in question is not a produce of this district, but is found in considerable quantity in the province of Piauhy, whence it is shipped at the port of Parnahyba in transit to this port for transhipment to England.

The gum which has thus appeared here consists of two different kinds. One is obtained from a tree called *Jatuba* [according to Burchell this is probably *Hymenæa Courbaril*, L.], and is of a whitish and pale yellowish colour, and in appearance like gum arabic. From what I understand it oozes out from the root or lower portion of the trunk, and is said to dissolve by heat. The other kind is from a tree called *Angico* [probably *Acacia Angico*, Mart.], and is a gum of reddish colour, oozing out by cutting the bark. This gum dissolves in water, and is considered a substitute for gum arabic.

I shall endeavour to obtain from Parnahyba specimens of leaves and flowers of these two kinds of gum, and shall be glad to forward them to you with all further information I may procure.

I have, &c.
D. Morris, Esq., (Signed) E. KANTHACK,
Assistant Director. Consul.

We have identified the plant known under the native name of Jatuba from Burchell as probably *Hymenæa*, and there is little doubt from the character of the gum that it is *H. Courbaril*, L., the Locust tree of the West Indies and the Simiri of Guiana. The gum of this tree partakes more of the nature of a gum-resin than of gum arabic; it is closely allied to gum Anime, and is used as a copal for varnishes. It is insoluble in water but soluble in alcohol with heat. It is extremely doubtful whether this was represented at all in the Brazilian gum arabic lately received in this country. The plant known under the native name of Angico is doubtless *Acacia Angico*, Mart. This is known to yield a soluble gum similar to gum arabic. Until botanical specimens are received at Kew, and the question authoritatively determined, we may assume that the bulk of Brazilian gum arabic is yielded by this latter species.

XLII.—TRINIDAD COFFEE.

The staple industries of Trinidad are sugar and cacao. The annual export of these two products are sugar, 700,000*l.*; cacao, 400,000*l.* Hitherto the cultivation of coffee has not assumed large proportions. Efforts were made by Mr. Prestoe in the years 1875–8 to draw attention to the desirability of cultivating coffee in Trinidad, and plants of Arabian and Liberian coffee were experimentally grown in the Botanic Gardens and distributed amongst cultivators. "Notes "on Coffee Cultivation in Trinidad" were published in the "Trinidad Royal Gazette" of 29th May and 28th August 1878. In these notes it was stated that, "the success which has attended a further extension of "coffee planting in the Botanic Gardens is an important evidence of "the reward that awaits extensive and high-class coffee cultivation in "this island." He further stated that "no more favourable con-"ditions for coffee planting could be desired than exists in the valleys "of the northern portion of the Island, east of the Maraval Valley. "In the upper part of St. Ann's Valley there are extensive plots of "coffee trees, which for vigour and fruitfulness are simply perfection."

Owing probably to recurring periods of drought and to the absence of suitable shade trees, coffee cultivation has not prospered in the lowlands of Trinidad. In other localities, and especially at a higher elevation, complete success would, no doubt, be attained.

In the report on the samples of Trinidad coffee contributed to the late Colonial and Indian Exhibition, it is stated that "they were of a "kind which would be very useful if picked with greater care, and "quite free from black, broken, and defective beans. They were worth "in their present state 53*s*. to 55*s*. per cwt., but might easily be made to "realise 5*s*. to 6*s*. more by careful picking and preparation . . . . . "It is doubtful if the Trinidad planters know how to remove the pulp "quickly and well after picking, and if they clean their parchment "well."

Mr. J. H. Hart, the recently appointed Superintendent of the Botanic Gardens at Trinidad, has turned his attention to the possibility of establishing a coffee industry in the island. In a letter addressed to Kew, dated 3rd March 1888, he mentions: "I send you three samples "of coffee grown here called respectively Creole, Hybrid Mocha, and "Mocha coffee. I am very desirous of obtaining the market value of these "samples, as I believe with proper appliances the coffee grown here "could be increased in market value at least 25 per cent. The samples "have been cleaned and prepared by fermentation."

In reply to this request the following letter with enclosures was addressed to the Colonial Office: —

SIR, Royal Gardens, Kew, April 11, 1888.

I AM desired by Mr. Thiselton Dyer to inform you that he lately received from the Superintendent of the Botanical Gardens, Trinidad, samples of coffee which had been prepared by him experimentally for the purpose of testing the merits of Trinidad coffee.

2. It appears that coffee cultivation at Trinidad has not so far proved a successful industry. The planters who have hitherto tried the cultivation have not been able to cure the produce in such a manner as to obtain remunerative prices.

3. Mr. Hart who takes an intelligent interest in local industries has very properly sought to improve the quality of Trinidad coffee by curing it according to the method so well pursued in regard to the Blue Mountain coffee of Jamaica.

4. The result of Mr. Hart's experiment according to the reports of the brokers enclosed herewith has improved the value of Trinidad coffee by about 25 per cent.

5. Mr. Thiselton Dyer is of opinion that the report of the brokers, as also the letter of Messrs. Shand and Haldane, will prove of interest to Sir William Robinson, to whom they might be communicated for the purpose of drawing attention to coffee growing as a possible means of extending the industries of the colony.

I have, &c.
(Signed) D. MORRIS.

Edward Wingfield, Esq.,
Colonial Office.

[Enclosures.]

MESSRS. SHAND AND HALDANE to ROYAL GARDENS, KEW.

SIR, 24, Rood Lane, E.C., April 7, 1888.

WE received your favour of 22nd ultimo, and we now have pleasure in enclosing report and valuation made by Messrs. Wilson

Smithett & Co., 41, Mincing Lane, of the samples of Trinidad coffee sent by you to us. A few words as to the system of coffee preparation generally adopted in Ceylon upon the estates may perhaps be of interest.

The coffee cherries are allowed to get fully ripe upon the trees, and care is taken in picking to avoid green and partially ripe cherries. The cherries are passed through machinery generally as soon as they are brought into the measuring loft from the field, though some planters prefer keeping them for a night in the loft before pulping, and believe thereby a better colour is obtained for the bean when it reaches market, though the parchment skin may not look so clean. In the operation of pulping the beans are squeezed out of the outer skin commonly called the pulp by passage through discs or cylinders and fall into cisterns, from which the water that carries them in is drained off, and they are then heaped up and left to ferment until such time as the mucilage with which the bean is covered can be washed off, a period varying according to temperature from 24 to 48 hours. When the coffee, now termed the parchment, is ready to wash water is run into the cisterns, and it is kept moving with batons until all the glutinous matter is removed ; it is then put on mats or an asphalte or cement drying ground and left in the sun to dry, and after two or three days' exposure it is ready to be sent to the mills in Colombo in bags.

A few estates in Ceylon, but very few if any now, prepare their coffee for market by peeling and sizing upon the estates, but the strong sun and heavy machinery required enable these operations to be carried out better in Colombo. The planter has to be careful to pick ripe berries, and ripe berries only, to see that his cylinders or discs are so set that the beans do not get pinched or bruised in passing through them and that the skin is separated from the parchment, not to allow his parchment to ferment too long, as though thereby the outer or parchment skin may become whiter and better bleached the bean loses the colour which the trade likes. The various operations of peeling, garbling, and sizing to be properly done require heavy machinery and ample room.

Full particulars as to coffee preparation upon plantations will be found in *Sub-tropical Cultivations* by R. C. Haldane, *Blackwood*, 1886.

We remain, &c.
(Signed) Shand, Haldane & Co.

D. Morris, Esq.

Dear Sirs, 41, Mincing Lane, E.C., March 27, 1888.

We have examined the samples of Trinidad coffee described as under experimental cultivation at Trinidad, and report as follows:—

Hybrid Mocha, of good liquor and flavour, the shape of the berry approximating to long-berry Mocha - - - - -	85*s.* per cwt.
Mocha, of indifferent liquor, but fair flavour, very small berry, similar to small East India	72*s.* ,,
Creole, fair liquor, ordinary flavour, similar to Central American - - - -	60*s.* ,,

All the samples roast evenly, showing that the berry is well prepared and ripened.

Yours faithfully,
(Signed) Wilson, Smithett & Co.

Messrs. Shand, Haldane & Co.

ROYAL GARDENS, KEW, to COLONIAL OFFICE.

SIR, Royal Gardens, Kew, April 23, 1888.

IN continuation of my letter of the 11th instant I am desired by Mr. Thiselton Dyer to forward to you, for the information of the Government of Trinidad, the enclosed copy of a letter received from Messrs. Lewis and Peat, of Mincing Lane, on the subject of cleaning "parchment coffee."

2. It would appear from this letter that an entirely new aspect has been given to the preparation of coffee for the English market by the establishment in London of a factory to clean parchment coffee in a cheap and expeditious manner.

3. It is proposed to treat this subject as regards its bearing upon West Indian coffee in the *Kew Bulletin* for the month of May next. Owing to the falling off of coffee production in the East Indies to the extent, it is said, of a million and a quarter cwts. annually, coffee cultivation in the West Indies should be largely augmented. The difficulties hitherto encountered by small settlers in the preparation of coffee are likely to be entirely overcome by the cleaning of parchment coffee in London, and this fact, in the opinion of Mr. Thiselton Dyer, cannot be too widely known in every West Indian Island.

I am, &c.
(Signed) D. MORRIS.

Edward Wingfield, Esq.,
Colonial Office, S.W.

[Enclosure.]

MESSRS. LEWIS AND PEAT to ROYAL GARDENS, KEW.

SIR, 6, Mincing Lane, E.C., April 17, 1888.

IN reply to your favour of the 16th instant we beg to inform you that the system of importing coffee in the parchment is largely on the increase, and some most satisfactory results have been attained.

We have recently sold large parcels from America which were "milled" here, and against 70*s*. per cwt. obtained last year for the same coffee cleaned on the plantation we obtained 86*s*. per cwt., although prices all round were lower. Experience shows that the husk or parchment protects the bean from atmospheric influences which affect the colour, and in every instance where trials have been made the result has been in favour of cleaning here. The process is quite simple, and the cost is 2*s*. 6*d*. per cwt., including everything. The coffee must be pulped and the cherry got rid of on the plantation, but the most important matter is the drying. It is absolutely necessary that the parchment must be perfectly dried and kept from moisture afterwards, insufficient drying is most damaging to after results, and must have the greatest care.

There is no advantage in selling the coffee in parchment as much better prices are obtained by cleaning it here. The grower is more than compensated for extra freight paid, loss in weight, &c., by the extra good out-turn of his coffee if properly cleaned here. Any further information we can furnish we shall be most happy to give you. We enclose a sample of parchment which is worth 35*s*. per cwt. in parchment, and when cleaned 80*s*. per cwt. The probable loss in weight is about 15 or 16 per cent. There would always be a market for coffee cleaned here, and as much as the West Indian Islands could produce would easily find a market.

We remain, &c.
(Signed) LEWIS & PEAT.

D. Morris, Esq.

COLONIAL OFFICE to ROYAL GARDENS, KEW.

SIR, Colonial Office, April 28, 1888.

IN reply to your letter of the 23rd instant, enclosing a copy of one from Messrs. Lewis and Peat, of Mincing Lane, on the subject of the cleaning of "parchment" coffee, I am directed by Lord Knutsford to acquaint you that a copy of it will be sent for publication to the Governors of the West Indian and other Colonies interested in the production of coffee.

I am, &c.
(Signed) EDWARD WINGFIELD.

The Director, Royal Gardens, Kew.

XLIII.—PATCHOULI.

(*Pogostemon Patchouli*, var. *suavis*.)

In the *Kew Bulletin*, No. 15, for March, 1888, page 71, an account was given of the patchouli plant used in perfumery. To this account was added some interesting notes respecting patchouli cultivated at Penang, under the charge of Mr. C. Curtis, Assistant Superintendent in the Forest Department. We are now enabled to supplement these notes by the interesting information contained in the following letter, recently received from Mr. Curtis :—

SIR, Penang, February 16, 1888.

I BEG to thank you for the determinations of Penang plants (1,140–1,201), and also for your kind letter of 16th December. Referring to your remarks on patchouli, it may interest you to know the result of an experiment in cultivating and harvesting one-twentieth of an acre of patchouli in the Experimental Nursery, Penang. Cuttings were put in in January, and the last week in February one-twentieth of an acre was planted three feet apart. The soil of the nursery is poor, and the only manure used was wood-ashes.

On July the 21st the whole was cut, and weighed in a green state 449 lbs. After being dried in a cool airy shed for 10 days the weight was 106 lbs. The leaves were then separated from the stems and each weighed separately, the result being, "good leaf," 69 lbs.; refuse, 37 lbs. Samples were submitted to two London brokers, both of whom said that the sample was good. One valued it at 8*d.* to 10*d.* per lb., and the other at 10*d.* to 11*d.*

The same patch was cut again the first week in January of this year, and the yield and results were approximately the same as in July; so that there is no doubt an acre of patchouli will yield considerably over one ton of "good leaf" per annum.

If there is a steady demand nothing better can be planted by native cultivators, as no special skill is required in its cultivation, or machinery of any kind in its preparation. That the system of cutting the whole patch at once is the best system possible I am by no means sure. I think if only one side of the rows were cut at first, and the remainder after that had commenced to grow again, there would be less exposure of the roots to the sun, and consequently less check to the growth.

The principal point to be observed in drying is to dry slowly and not to the point of crispness, otherwise the leaves get broken to powder and are of less value.

I mentioned some time ago, when sending a sample to Kew, that the leaves of the *Urena lobata* are used for adulteration.

Can you inform me whether patchouli is used for any other purpose than for perfumery?

I remain, &c.
D. Morris, Esq. (Signed) C. CURTIS.

XLIV.—COCHIN CHINA VINE.

(*Vitis Martini*, Planch.)

An apparently new species of vine has been received at Kew from the Botanic Gardens, Hong Kong. It was sent by Mr. Ford as *Vitis Martini*, Planch. From botanical specimens also contributed by Mr. Ford to the Kew Herbarium Professor Oliver has identified the plant as *Vitis* (*Ampelocissus*) *Martini* of Planchon, but he is doubtful whether it is specifically distinct from *Vitis barbata*, Wall., of Bengal and Burma As plants of this vine have been distributed from Kew to correspondents in the Colonies it is desirable to place on record all the available information respecting it. In the report of the Superintendent of the Botanical and Afforestation Department, Hong Kong, for the year 1885, the following interesting account is given of the Cochin China vine:—

"Another plant of considerable interest is a new tuberous-rooted " vine, *Vitis Martini*, Planch., from Cochin China. It fruited this " year in Hong Kong for the first time. The seeds were procured " from the Botanic Gardens, Saigon, in 1883. The seedlings were " planted out the same summer and made several shoots, each of which " died down in the winter. They began to make fresh shoots about " the middle of April, 1884, and grew well during the summer, but " showed no inclination to flower; and again died down in the winter. " Last summer they started vigorously and showed flower about " the end of May. Many of the bunches, however, failed to develop " fruit, owing, apparently, to imperfect fertilization; but there was a " good average crop of bunches on the canes irrespective of the failures. " The fruit was ripe in October, many of the bunches weighing a " pound each. The berries, when ripe, are jet black, and rather under " the average size of ordinary grapes. The seeds are large in propor- " tion to the size of the berry. The flavour is a peculiar blending of " sweetness and acidity, very pleasant, but tending, in my case, to leave " a curious smarting sensation on the tongue; others might not find " this peculiarity at all objectionable. The flavour might be altered, as " is well known, by varying the mode of cultivation; but the size of " the seeds is likely to prevent the grape becoming popular as a table " fruit; it may, however, be very well adapted for a wine producer. " A number of seedlings of this vine were distributed amongst residents " of the Colony, but I learn that none of these plants have fruited. A " few remarks as to the mode of cultivation may therefore be useful. " The tubers should be planted at a distance of 12 feet apart in well " manured soil, taking care to keep the manure near the surface as the " tubers take a horizontal direction, and do not penetrate the soil to " any great depth. When the shoots appear in the spring it is well to " cut off all the weak ones, leaving only four strong canes; these " should be trained along a trellis or wall, as the case might be, leaving " a width of 3 feet between the canes. All the lateral branches should " be pruned back to within one bud of the main rod, except those "laterals that show bunches; but it will be found that very few "bunches will be developed on the lateral shoots, most of the bunches "springing directly from the main rods; but in the case of a bunch "springing from a lateral branch the branch should be stopped at the "second bud above the bunch. The laterals might be allowed to grow "till they are 2 feet long. It will then be seen if they are likely "to throw out bunches or not. If not, prune them back as described, "and also pinch back all subsequent growth as it appears. It may "be found necessary to thin out the leaves to allow the sun to get at "the branches, but in doing this great care should be taken not to "break or otherwise injure the leaf directly above the bunch. If this "happen to be accidentally removed the bunch below it will ripen "immaturely and soon shrivel up. It is an advantage to thin out the "bunches, leaving a space of 15 or 18 inches between them. It "is also advantageous to thin the berries, leaving hardly one half of the "original quantity on each bunch; but I am afraid this process would "prove impracticable if the vine were extensively grown, owing to the "labour it would entail. After the fruit is gathered the vines require "no farther attention till spring. By way of experiment one lot of "plants were allowed to grow at will. Some of them threw up as "many as a dozen suckers and produced laterals in profusion, but they "all failed to flower. Another lot was transplanted into well-manured "ground just as the crowns began to push in the spring; they, too, "failed to flower, and presented rather a sickly appearance during the "summer.

"The 'Horticultural Press' has already suggested that this vine "should receive the attention of vine growers in the wine-producing "countries of Europe where the phylloxera has denuded the vineyards "of the old class of vines. There being no phylloxera in Hong Kong, "I cannot say whether the dreaded insect would spare this vine, but in "view of the wonderful improvements that have been and can be "brought about by skilful and persistent cultivation, it is not un-"reasonable to surmise that this new vine may ultimately become a "wine producer. It is easily cultivated, and seems to be well adapted "for a tropical climate, or a climate in which the resting season is "comparatively cold and the growing season hot."

XLV.—MADAGASCAR EBONY.

The information contained in the following correspondence respecting ebony and sandal-wood at Madagascar will be read with considerable interest. In the absence of botanical specimens of the plants in question it is impossible to express an opinion as to their identification. The flora of the lowlands of Madagascar is very imperfectly known at present, and it is most desirable to draw the attention of Consuls and all who may have the opportunity to the importance of collecting and forwarding specimens of the plants known to yield ebony and sandal wood to Kew for the purpose of identification. Mr. J. G. Baker, Principal Assistant in the Kew Herbarium, has for many years devoted attention to the flora of the mountainous parts of Madagascar, and has described the plants, collected for the most part by the Rev. R. Baron, in recent numbers of the *Journal* of the Linnean Society. The work now necessary is to explore the lowlands of Madagascar and make collections of plants, which it is confidently anticipated will prove of the greatest possible interest.

It is well known that the heart wood of many different species of *Diospyros* constitute the ebony of commerce. There are 10 endemic species of *Diospyros* at Madagascar, but it is impossible to identify any one of these as yielding commercial ebony. Mr. Godfrey T. Saunders, who has an extensive knowledge of the hard woods of commerce, states that, "at present the only Madagascar wood "known in this country is ebony, and in this my house is the largest "operator. Hitherto we are dependent for supplies on the French "and German houses. We understand the wood at present is smuggled "out of the country. A properly organised management should put a "stop to this state of things and enable us to get the wood under the "best possible conditions as to proper felling and shipment. There is "a large and increasing consumption for this wood."

True sandal-wood is yielded by different species of *Santalum*. Indian sandal-wood is derived from *Santalum album*, L., and West Australian sandal-wood from *Fusanus spicatus*, R. Br. A "contribution to the "Knowledge of Sandal-woods" is given by Andreas Petersen in *Journal*, Pharmaceutical Society, vol. xvi. [3], p. 757.

According to Mr. Baker there is no species of *Santalum* known from Madagascar, and *Pterocarpus* which yields red sandal-wood or Saunder's wood is doubtfully native. In the northern parts of Madagascar, according to M. Cachin, a wood with properties similar to sandal-wood is known under the Sakalava name of Hasoranto, while another wood called Làza smells of aniseed. The latter is probably *Croton anisatum*, Baill. in Adansonia, Vol. I., p. 159.

In the Kew Museums there is a specimen of wood labelled "*Santal* "*vert* (Croton sp.), exported from Madagascar and Zanzibar into "India, where it is said to be used for burning the bodies of Hindoos." Also a specimen from Mr. J. Heathcote, from Professor MacOwan, received February 6, 1886, labelled "Wood like sandal-wood (Croton "sp.). It is ground and mixed with water, and used by the natives "at Inhambane to anoint themselves."

These latter are not properly sandal-woods. They are mentioned as indicating the possible source of what is called sandal-wood at Madagascar. The correspondence is as follows:—

THE FOREIGN OFFICE to ROYAL GARDENS, KEW.

SIR,

Foreign Office, March 19, 1888.

IN reply to your letter of the 12th instant I am directed by the Marquess of Salisbury to transmit to you herewith an extract from Vice-Consul Knott's report, relating to the ebony trade on the West Coast of Madagascar.

I am to add that Lord Salisbury has no objection to this extract being published in the *Kew Bulletin*, and communicated to Mr. Ransome.*

I am &c.
(Signed) T. V. LISTER.

D. Morris, Esq.

[Enclosure.]

British Vice-Consulate, Mojanga,
December 12, 1887.

SIR,

I HAVE the honour to inform you that, up to the present time, no person having been granted a concession to export ebony from the West Coast, all that is shipped is smuggled out of the country.

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* Mr. Lewis Ransome (of the firm of A. Ransome & Co., Chelsea) has been preparing himself at Kew for a botanical survey of the English concession in the district of Maroantsetra, North-east Coast of Madagascar.

In the Sakalava country, south of Manitirano, there are large tracts of forest in which the ebony tree is found and cut by the Sakalava and bought to Manitirano, and there sold to the Indian and Arab traders in exchange for cloth for merely nominal amounts. Some comes north to Soulala in Baly Bay and there exchanged.

The Indian and Arab traders send it to Mozambique and Nossi Be, and, if large and sound wood, it fetches from 40 to 55 dollars a ton.

I heard also when I was in Majumba Bay that ebony grows on the banks of Nemside Bay and is sent to Nossi Be, that there were large trees there, but I was unable to go as small-pox was raging in all the principal towns.

I myself found ebony close to Ampasimerima, about 20 miles N.E. of Mojanga, marked in Oliver's map incorrectly Pajong; it was here both small in size and quantity; from there to Ambolivozy, a village on the southern entrance of Mojamba Bay, I did not discover any, but it seemed to recommence there in small quantities, and extended along the southern bank of the bay. At Ampasamalavatra, on the bay there were large quantities of small wood and a few large trees; and at Androhibe, about 10 miles inland, I saw several fine old trees of ebony. At Amboeliana, not far from there, I cut some samples of sandal-wood, and sent same to London, and informed that its value there is from 25*l.* to 60*l.* a ton.

* * * * * * * *

From Soulala to south of Manitirano (Manitirano excepted) it is said to be unsafe for a white man to go, and impossible for a Hova. And, again, south of Morandava the same thing occurs; but in a few Sakalava villages there are creole traders' agents for McGubbin, of Liverpool.

In my opinion the only way the ebony trade can be worked on this coast is by opening stations on the rivers where the ebony grows, and employing Sakalavas and Makoas at a monthly wage with an English overseer at each station; he, of course, would have to take cotton goods, &c., as the wages are mostly paid in goods, coin being of no value to the Sakalavas. This way would, I think, ensure a regular supply of good wood being obtained, and avoid the cutting of small and useless wood.

I have, &c.
(Signed) STRATTON C. KNOTT,
British Vice Consul.

J. G. Haggard, Esq.,
H.B.M. Consul for Madagascar.

XLVI.—SHANTUNG CABBAGE.

(*Brassica chinensis*, L.)

In a letter dated 21st April 1887, Mr. George Hughes, late Commissioner of Customs at Chefoo, China, offered the Royal Gardens seeds of a cabbage which has long been in high repute in China, but which appears to be little, if at all known, in this country. Mr. Hughes stated: "I have just received from Chefoo, North China, a small "packet of Shantung Cabbage seed, and I should like, if possible, to "introduce this delicious cabbage into England. It grows in the "north of China, is lettuce shaped, and weighs from 5 to 8 lbs. When

" boiled it is nearly as good, if not quite, as sea kale: eaten raw, in a " salad, it is of so delicate a flavour that I know of no vegetable in " England to approach it. It is an autumn cabbage, should be planted " about 18 inches apart, thrives best with moisture, and in Shantung is " well watered every day; there the seed is sown in June. When " nearly full grown it should be tied round so as to give it a good white " heart. If it can be acclimatized in this country it will be a great " addition to our vegetables."

The seeds received at Kew being few in number were carefully cultivated. They were sown in a heated pit on the 3rd May, and in about a fortnight all had germinated. They were pricked off into boxes, and when large enough transferred to pots. They were kept in a cold frame until the beginning of June, when they were planted out in beds of rich soil about 18 inches apart in the rows, and the same distance from row to row. About the middle of July the plants were tied up in the same way as Cos lettuce, and when well filled and blanched were cut for use. They were pronounced to be excellent. The seed ripened only sparingly, probably owing to the dry weather of last summer.

It is possible that this Chinese cabbage may prove a useful addition to English gardens. The kinds most highly esteemed at Pekin are those from the neighbourhood of the little town of Ngan-sun. These are said to be reserved for the table of the Emperor. They are eaten either raw in a salad or cooked and seasoned with salt.

Under suitable circumstances the cultivation of this cabbage would doubtless prove as simple and as successful as with the ordinary cabbage. Botanical specimens of Chinese cabbage were received at Kew in 1886 from Mr. F. S. A. Bourne, H.M. Consular Agent at Chungking. Under the native name of Pai-tsai he describes it " when young it is " eaten as a cabbage. It is also cultivated for its seeds, from which oil " is pressed and used for light and cooking." In the *Index Floræ Sinensis*, Part I., p. 46, by Forbes and Hemsley, *Brassica chinensis*, Linn. Amœn. Acad. IV., p. 280, is reduced under *Brassica campestris*, L. A list of Brassiaceous plants from China, with notes supplied by Mr. Bourne, is published by Mr. Hemsley in *Gardener's Chronicle*, Vol. XXVI. [New Series], 1886, p. 40.

A very complete account of the Shantung cabbage is given in *Le Potages d'un curieux histoire, culture et usages de 100 plantes comestibles peu connues ou inconnues*, par A. Paillieux et D. Bois, Paris, 1885. It is here described as Pé-tsai, or Chou de Chine (*Brassica chinensis*, L.) Further information may be obtained from the *Bulletin de la Société Centrale d'Horticulture de France:* Note sur la culture du Pé-tsai aux iles Maurice et de Bourbon, par M. Breon, Vol. XXIII., p. 142.

Mention is also made of the Chou de Schangton, or Pé-tsai, in the *Bulletin de la Société d'Acclimatation:* Productions de la Chine, par M. l'Abbé David, 2e série, t. II., p. 237. Ce mémoire contient, au sujet du Pé-tsai, ce que suit: " Comme plantes alimentaires, on trouve " dans nos jardins . . . . . le Pé-tsai, dont les Chinois consomment " une énorme quantité, et qui vaut plus que tous les autres légumes " réunis; les Européens le trouvent aussi fort bon et de meilleure " digestion que les divers Choux d'Occident."

A figure with cultural hints on Chinese Cabbage, or Pé-ts-ai, is given in the *Vegetable Garden* by MM. Vilmorin-Andrieux. London: John Murray, 1885, p. 146.

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ROYAL GARDENS, KEW.

BULLETIN
OF
MISCELLANEOUS INFORMATION.

No. 18.] JUNE. [1888.

XLVII.—MANUFACTURE OF QUININE IN INDIA.

The following important papers have been communicated to this establishment by the Government of Bengal, and are published for the information of the colonies in which Cinchona is grown.

The historical summary of the introduction of quinine-yielding plants from South America into India, may be supplemented by a reference to the annual reports of the Royal Gardens, from 1862 to 1880, which give in detail an account of the part played by this establishment in successfully carrying out this important enterprise. From Kew the different species of *Cinchona* were also distributed to Ceylon, and other British tropical colonies.

Hitherto red bark (*Cinchona succirubra*) has been the dominant species cultivated in the Sikkim plantations. This was entirely worked up in the manufacture of febrifuge, which contained but a small proportion of quinine, but a large amount of Cinchonine and Cinchonidine. The new process now described is intended for the manufacture of quinine from yellow bark (*Cinchona Calisaya*). If successful, it will lead to the substitution of Indian-manufactured quinine for the febrifuge in the hospitals and dispensaries of India, and as a necessary consequence to the substitution of yellow bark for red bark in the Sikkim plantations.

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY EYRE AND SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.

And to be purchased, either directly or through any Bookseller, from
EYRE AND SPOTTISWOODE, EAST HARDING STREET, FLEET STREET, E.C.; or
ADAM AND CHARLES BLACK, 6, NORTH BRIDGE, EDINBURGH; or
HODGES, FIGGIS, & Co., 104, GRAFTON STREET, DUBLIN.

1888.

Price Twopence.

FINANCIAL DEPARTMENT, CALCUTTA, March 26, 1888.

Apprehensions of the extermination, in their native forests, of the quinine-yielding Cinchona trees having reached an acute stage about 30 years ago, the Government of India decided to take effectual steps to introduce their cultivation into India. The collection of seed and seedlings in the wide tract of difficult country over which the best medicinal sorts are naturally scattered, was no easy task. But it was successfully accomplished by Messrs. Markham, Pritchett, Spruce and Cross. Contemporaneously with these efforts on the part of the English Government, the Dutch authorities were at work on behalf of their Malayan Colonies, and by the year 1862, Cinchona cultivation had been successfully initiated in India and Malaya. The localities selected for the experiment of Cinchona growing in India were the Nilgiris and British Sikkim. And the excellence of this selection has been proved by the fact that the original nurseries in both localities have developed into large plantations which still remain in the hands of Government. From these two centres, seed and seedlings have been freely distributed to planters, and large tracts of land, especially in Southern India and Ceylon, have been covered with Cinchona trees by private enterprise.

2. The Cinchona trees thus introduced into India are practically of two sorts: (1) *quinine* yielders, and (2) *mixed Alkaloid* yielders. Of the quinine yielders there are two kinds, viz., *yellow* or *Calisaya* (including *Ledgeriana*), and *Crown* or *officinalis*, barks. Of the mixed alkaloid yielders, there are also two kinds, viz., *red* or *succirubra*, which has been in cultivation from the beginning, and a kind which has come into prominence during the past few years, and which, in annual reports, has been referred to as *Hybrid* bark. Red bark contains a comparatively small proportion of quinine, with large proportions of Cinchonidine and Cinchonine. It had been chiefly used by druggists in the preparation of decoctions and tinctures, and had not been used by quinine makers as a source of quinine. This red-bark tree was, however, the kind which, in the early days of the cultivation, it was found most easy to propagate; and in all plantations, both public and private, it greatly preponderated over the other sorts.

3. The cultivation of Cinchona trees having been pushed beyond the region of experiment, the next problem that presented itself was the utilization of their bark. For the private grower, the most lucrative course, up to the present time, has been to sell the crude bark in London. The object of Government was not, however, to secure a financial success, but to provide the people of the country, at the lowest possible rate, with an efficient remedy for the most prevalent of all the diseases of the country. The first step for Government to take was, therefore, to discover whether it was really a fact that quinine is the only alkaloid worth extracting separately from Cinchona bark, and whether Cinchonidine and Cinchonine might not each be an efficient febrifuge. It was true that quinine alone had got into use as a febrifuge, and that it alone of the Cinchona alkaloids had found a place in the British Pharmacopœia. On the other hand, tinctures, decoctions, and various pharmaceutical preparations of red bark, into the constitution of which all three alkaloids must undoubtedly enter, had for many years borne the reputation of excellent remedies for fever. The presumption, therefore, appeared to be that the position claimed for quinine as the only real febrifuge yielded by Cinchona bark, would prove, on careful examination, to be untenable; and that the other two alkaloids would also be found to have value as febrifuges. For the purpose of

investigating this point, commissions of medical officers of all three Presidencies were formed during the years 1866 to 1868. These commissions were furnished with supplies of the three alkaloids, pure and unmixed, and after very extensive trials, their unanimous verdict was that Cinchonidine and Cinchonine are both excellent febrifuges, the former not much less efficient than quinine itself.

4. Having thus established the value of Cinchonidine and Cinchonine, the next point to be settled was how best to utilize the large stocks of these alkaloids contained in the bark of the trees growing in the Government plantations. To do this, Messrs. Broughton and Wood, two professional chemists, were engaged in England, and were located as Government quinologists on the Nilgiri and Sikkim plantations respectively. Mr. Broughton (the Nilgiri quinologist), as the result of his labours, invented a preparation of red bark, which he called *Amorphous quinine*, and which contained all the alkaloids of red bark in the form of a non-crystalline powder. Of this Amorphous quinine, no large amount was ever manufactured; and its preparation ceased when Mr. Broughton resigned the service of Government. Mr. Wood, who did not arrive at the Sikkim plantation until 1873, concluded, after much observation and experiment, that the best way of utilizing the red bark was to make from it the preparation now so well known as Cinchona febrifuge. This, like Mr. Broughton's, is in the form of a powder, and contains the three chief alkaloids of red bark mixed in the proportions in which they naturally occur in the bark. Cinchona febrifuge was then a perfectly new product, unknown to pharmacy, and it was not clear how it might be accepted by the medical profession.

Mr. Wood, therefore, adopted for its manufacture, on a small tentative scale, a simple and inexpensive acid and alkali process, requiring only the rudest apparatus. He intended, should the product be favourably accepted by the medical profession, to replace this simple process by one more efficient, but more complicated, and involving the extensive use of spirit. During the first year of its manufacture (1874–75), only 48 pounds of this new drug were issued. At first, and chiefly owing to, a misapprehension as to the proper dose in which it should be given, some prejudice existed against this drug. In 1875–76, however, 1,940 pounds of it were consumed, and its consumption so materially increased during succeeding years, that, up to the present date, no less than 87,704 pounds have been issued from the factory. A preparation similar to, and avowedly an imitation of, Cinchona febrifuge, is now made and sold in London under the name of *Quinetum*, but until Cinchona febrifuge had first been manufactured in India, no similar preparation existed. It is, therefore, a remedy for which the world at large is indebted to India. Cinchona febrifuge has been used in India as a substitute for quinine. It has been so used by Government in its own medical institutions, and it has been freely offered to the Indian public. Its sale has, however, been restricted to the limits of India. From the beginning, and until now, its price has uniformly been 16 rupees 8 annas per pound, and in this respect it has presented a contrast to quinine, the price of which has fluctuated considerably, rising at one time as high as 16*s*. 6*d*. per ounce. According, however, to statistics prepared by an English pharmacologist, the average price of quinine in London from 1875 to 1887 (the period during which Cinchona febrifuge has been in use) has been 8*s*. 4½*d*. per ounce. The sterling value (calculated at this average rate) of 87,704 pounds of quinine would be 587,616*l*., while this quantity of febrifuge has actually been delivered to the Indian consumer for the sum of Rs. 14,47,116.

The actual saving to India has, therefore, been very great, and the capital account of the plantations (about 11 lakhs of rupees) has been covered several times.

5. The preponderance of red bark trees in the Sikkim plantation, while he was attached to it, naturally induced Mr. Wood to give his attention first to the utilization of their bark. But he by no means neglected the quinine barks. Of these barks only one,—*Calisaya* and its variety *Ledgeriana*,—really thrives in Sikkim, the Crown bark, or *Cinchona officinalis*, tree having proved a comparative failure. Mr. Wood made many experiments in the manufacture of pure sulphate of quinine; but, up to the time of his retirement, for private reasons, from the service of Government in 1879, he had not succeeded in discovering an efficient process. Mr. Wood was of opinion that good quinine barks could be grown in Sikkim, and that it might be possible to extract the quinine from them on the plantation. Dr. King, the superintendent of the plantation, was very strongly of this opinion, and in 1875 he recommended that all further planting of red bark trees should cease. This recommendationn was not acted upon for some time. Full effect, has, however, been given to it of recent years, and *succirubra* has been supplanted by *Calisaya* to the extent of about a million trees. The retirement of Mr. Wood did not put an end to the experiments on the manufacture of quinine. Mr. Gammie, the resident manager, took the matter up with energy, and, encouraged and assisted by Dr. King, he carried on a long series of experiments on an acid and alkali process of manufacture by which he succeeded in producing excellent quinine. He never, however, succeeded in recovering much more than half of the amount contained in the bark upon which he operated. The acid and alkali process had therefore to be abandoned as wasteful and inefficient. A process depending on the maceration of the bark in spirit was next tried; but, after much experiment, it was in turn abandoned. During a visit which he paid to Holland in 1884, Dr. King acquired some hints as to a process of extraction by means of oil. And now, benefiting by the advice of some chemical friends, Mr. Gammie has been able to perfect this process, with the result that the whole of the quinine in yellow bark can be extracted in a form undistinguishable, either chemically or physically, from the best brands of European manufacture. This can be done so cheaply that, as long as the supply of bark is kept up, quinine need never cost Government much above 25 rupees per pound. It is true that at the present moment, quinine is obtainable in the open market at rates not very different from this, but that is due to entirely exceptional causes. For some time back the Ceylon planters have been uprooting their Cinchona trees, both to save them from disease, and to make way for tea planting, which appears now to be becoming the principal industry of that colony, and Cinchona bark has actually been sold in London below the cost of its production in Ceylon. Indeed, so far has the fall in price gone, that South American bark has been practically driven out of the market. This is a state of matters which cannot continue very long, and which is not likely to recur. In the ordinary course, therefore, quinine might be expected soon to rise to what may be considered its normal price. The object of making public the process now discovered is to check this rise in the price of a drug of such general utility.

6. The cordial thanks of Government are due to Dr. King and his coadjutors—and especially to Mr. Gammie—for the patience, energy, and resource displayed by them in their long search for the best method of utilizing these valuable medicinal barks. The Government has no

desire to make a profit by the discovery, and the details are now produced in order that private growers of Cinchona may be enabled to take full advantage of the process, and that a permanent reduction in the price of quinine may ensue.

COLMAN MACAULAY,
Secretary to the Government of Bengal.

Method of Extraction of the Alkaloids from Cinchona Bark by Cold Oil as used at the Government Cinchona Factory in Sikkim.

In order that the oil may speedily and effectually act on the Cinchona bark, the latter is reduced to a very fine powder by means of Carter's disintegrator, and to get the powder of a uniform fineness it is passed through a scalper, which is a machine commonly used for sifting flour. The scalper is in the form of a box enclosing a sloping six-sided, revolving chamber, covered with silk of 120 threads to the lineal inch. It is driven at the speed of about thirty revolutions to the minute. Any particles of the powder which may be too coarse to pass through the silk meshes drop out at the lower end of the revolving chamber and are again passed through the disintegrator.

2. A hundred parts of the finely-powered bark are then set aside to be mixed with eight parts of commercial caustic soda, 500 parts of water, and 600 parts of mixture composed of one part of fusel oil to four parts kerosine oil. If the caustic soda be of inferior quality, a little slaked lime (about five parts) may be use in addition to the eight parts of caustic soda, or caustic soda may be altogether omitted, and 15 parts of slaked lime may be used instead of it. The caustic soda is dissolved in the water and mixed with the bark. Then the oil is added, and the whole is kept thoroughly intermixed in an agitating vessel. Should lime be used, it is mixed in fine powder with the dry bark before adding the water and oil.

3. The agitating vessels in use at Mungpoo are barrels with winged stirrers revolving in them vertically, and with taps on the sides for drawing off the fluids. The first stirring is carried on for four hours, and then the whole is allowed to rest quietly in order that the oil may separate out to the top of the watery fluid. When the oil, which has now taken up the greater part of the alkaloids, has cleared out, it is drawn off by a tap placed just above the junction of the two fluids. The oil is then transferred to another agitator, and is there thoroughly intermixed with acidulated water, for five or ten minutes, the mixture being again allowed to rest for the separation of the oil. It will now be found (if sufficient acid has been used and the stirring has been thorough) that the alkaloids have been removed from the oil to the acidulated liquor. The oil is again transferred to the bark mixture, and is kept intermixed with it for two or three hours; the oil is again drawn off in the same way, washed as before in the same acidulated liquor, and this process is repeated a third or a fourth time or until it is found, by testing a small quantity of the oil, that the bark has been thoroughly exhausted of its alkaloids. Each stirring subsequent to the second need not be continued for more than an hour. The quantity of acid required to take up the alkaloids from the oil will entirely depend on the quality of the bark operated on. If the bark contains 4 per cent. of alkaloids, about 2 lbs. of either sulphuric or muriatic acid mixed in 20 gallons of water should be sufficient, and so on in proportion.

4. The after-treatment of the acidulated water containing the alkaloids depends on the product desired, and on the kind of acid that has been used. Should sulphate of quinine be desired and sulphuric

acid have been used, the liquor is filtered (if necessary), heated and made neutral by adding a very weak solution of either caustic soda or liquor ammonia. It is then allowed to cool, and as it cools the crystals form out. These crystals are afterwards separated from the mother liquor by draining through a cloth filter. After they have been thus obtained, the crystals are dried. They are next dissolved in about 50 times their weight of boiling water. The resulting liquor is filtered hot through a little animal charcoal. On cooling after filtration, the crystals again form out, and they are separated as before from the mother liquor by filtration through a cloth. The crystalline mass obtained by filtration is then placed in small lumps on sheets of white blotting paper stretched on slabs of plaster of Paris. By this means they are practically dried. They are afterwards thoroughly dried by being laid on blotting paper in a room heated to about 10 degrees above the temperature of the open air.

5. If Cinchona febrifuge is wanted, the alkaloids are exhausted from the oil by muriatic acid, the solution being neutralized and filtered in the same way. On an excess of caustic soda solution being added, the alkaloids are precipitated. After standing some hours, the whole bulk of liquor and precipitate is passed through cloth filters; and when the alkaline liquor has drained off, the precipitate is washed with a little plain water, dried, and powdered. The powder is Cinchona febrifuge ready for use.

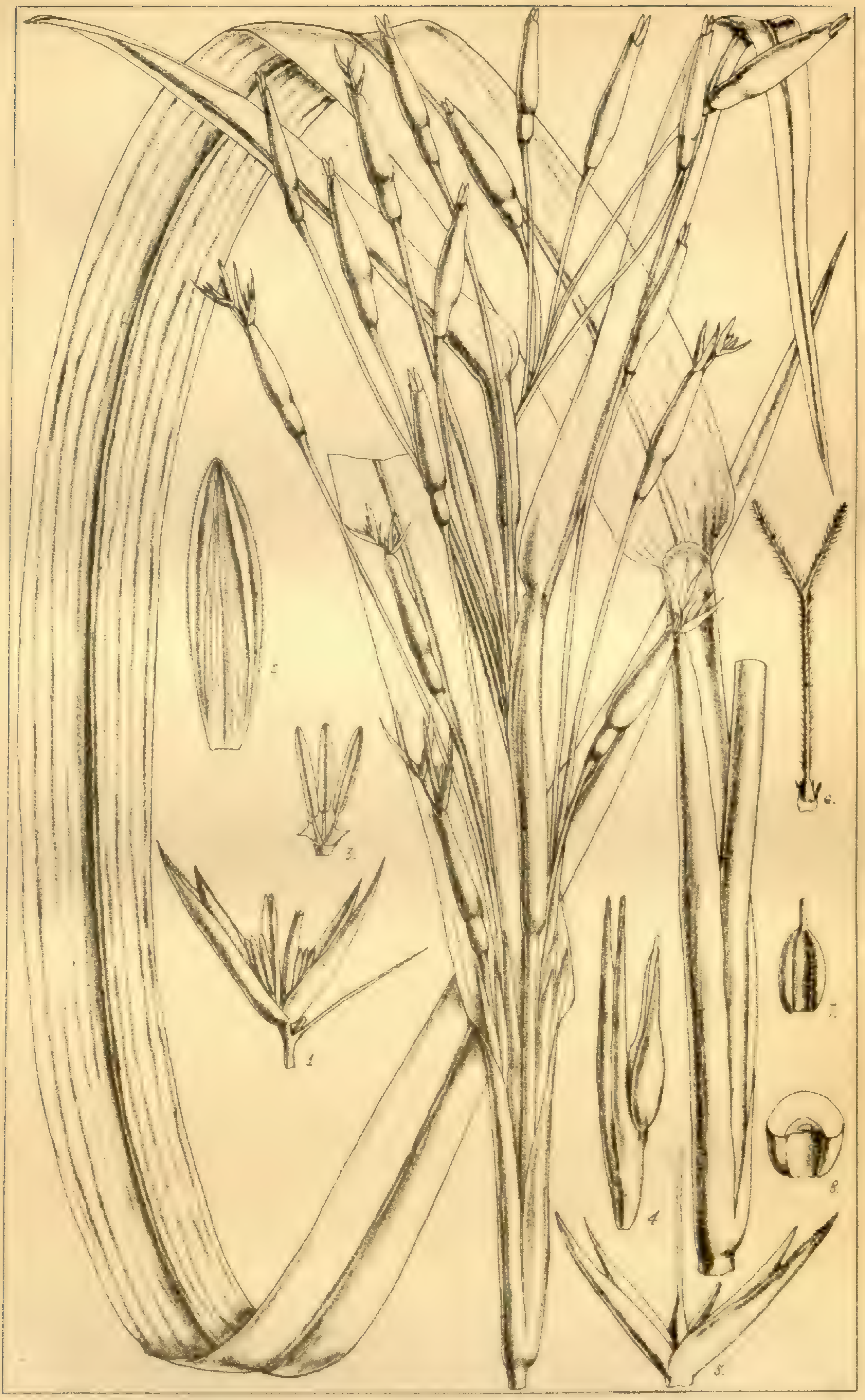
March 24, 1888. J. A. GAMMIE.

XLVIII.—JOB'S TEARS.

(*Coix Lachryma, L.* var. *stenocarpa.*)

The round shining fruits of a grass widely distributed in tropical countries are familiarly known as Job's Tears. The fruits when young are supposed to have some resemblance to heavy drops of tears, and hence the fanciful name they bear. The plant, a native of the East Indies and Japan, belongs to the tribe *Maydeæ* of the natural order, Gramineæ. It is a tall growing grass, now commonly found in damp places in the tropics of both hemispheres. In many countries it is regarded as a troublesome weed and a source of annoyance, especially in rice fields. As far as we are aware, the fruit possesses no nutritive qualities, and, except in one instance which has come under the notice of Mr. C. B. Clarke, F.R.S., in the Naga Hills, Assam, it is not cultivated as a grain nor used in the wild state. The stem is stout, erect, and smooth in all its parts. In favourable situations it often attains a height of three to five feet. The leaves are broad and flattish, about a foot long, with a distinct midrib. The flowers are monœcious, male and female in different parts of the same panicle. The female flowers are one or more in number at the bottom of each branch of the panicle. They are enclosed in a hard bottle-shaped or round white or grey involucre, from which the long stigmas protrude. The male flowers are in the upper spikelets, numerous and two-flowered. After flowering, the simple branches of the panicle break away above the female spikelets, so that when the fruit is ripe, the male spikelets have entirely disappeared.

The globular Job's Tears as commonly found in the tropics are used for necklaces, and in various ways as articles of ornamentation. The usual colour is white, but they are sometimes found slightly tinged with pink, and sometimes grey, or almost black.



M.S. del. et lith.

Coix Lachryma, L. var. stenocarpa.

The present variety of Job's Tears with long cylindrical involucres was brought into notice at the late Colonial and Indian Exhibition, 1886. In the ethnological collections in the Indian Court the clothing of Karens (a semi-aboriginal tribe inhabiting certain districts of Lower Burma) was prettily ornamented with these cylindrical involucres, and attracted considerable attention. As these were not represented in the Kew museums, application was made to the India Office for a small sample, which, at the request of Lord Cross, was lately forwarded to Kew by the Chief Commissioner of Burma. The involucres in this sample vary from five to nine lines in length. They are usually more or less fusiform, tapering at the ends to about one line in diameter. The mean thickest part is about 1½ line in diameter. For herbarium specimens of the plant yielding these fruits, we are indebted to Dr. George Watt, Scientific Assistant to the Director of Agriculture, Calcutta. There is a form with shorter involucres collected at Mergui by Mr. Griffith. In a note attached to pl. 1,764, in the *Icones Plantarum*, Vol. VIII., Professor Oliver states that the Kew Herbarium possesses, in addition to the packet of involucres from the India Office, " a letter from Mr. R. Bruce, of Balipara, Assam, to Mr. H. C. Read, " of the British Museum, saying that the involucres are known to the " Assamese and the Meris, and called by them the cowr-monee or crow " bead, from the fondness of these birds for the berry."

In an office memorandum, dated Simla, 22nd December 1887, Dr. Watts states, that " the grain (of this variety of Job's Tears) is not " likely to prove of any great economic value as a source of food, but " it stands an admirable chance of being largely used in Europe in the " construction of artificial flowers, laces, bugle trimmings, and other " purposes for which glass beads are being used. If capable of being " dyed a deep black colour, there might be a very extensive demand, " since such beads would be infinitely more durable than glass. " During the Exhibition, several gentlemen, especially from France, " inquired after seeds suitable for the above purposes. The writer " was not able at the time to furnish them with samples of the cylin- " drical form of Coix now under consideration, but showed them the " ordinary spherical form. They seemed to think there was some " prospect even of the common spherical form coming into use, but " objected to its large size. This led the writer to show them " the Karen garments with the cylindrical form of seeds used as " decorations. This they were highly pleased with. In hopes of still " further developing the matter, the writer drew Mr. Thiselton Dyer's " attention to them, with the result that the present inquiry has now " been instituted."

We are enabled, by permission of the Bentham Trustees, to add a plate of this variety of Job's Tears, from the current issue of the *Icones Plantarum* [Vol. VIII., pt. 3, pl. 1,764].

XLIX.—RAMIE OR RHEEA.

(*Boehmeria nivea* var. *tenacissima*.)

The plant known under the several names of China Grass, Ramie, or Rheea, belongs to the natural order, *Urticaceæ*, and hence it is not a grass at all, but a species of nettle, somewhat resembling in appearance and habit of growth, the common nettle of Europe.

The China Grass plant, first known and long cultivated by the Chinese under the name of Tchou Ma, is the *Boehmeria nivea* of botanists. The specific name, nivea, was given to it on account of the white appearance on the under-side of the leaves. A plant called in Assam, Rheea, and in the Malay Islands, Ramie, was believed by Roxburgh to be distinct from the Tchou Ma of the Chinese, and it was named by this botanist *Boehmeria* (*Urtica*) *tenacissima.* In this plant there is an absence of the white-felted appearance on the under-side of the leaves, so characteristic of the China Grass plant, but in all other respects the two plants are indentical in their botanical characters.

For purposes of classification, the Tchou Ma, or China Grass plant, *Boehmeria nivea,* may be accepted as the typical species, and the Rheea or Ramie retained as a geographical variety of it, under the name of *Boehmeria nivea* var. *tenacissima.* This latter is sometimes known as the Green-leaved China Grass, a name which may be conveniently retained for it.

The fibre yielded by these plants has been long recognised as pre-eminent amongst vegetable fibres for strength, fineness, and lustre. Hence numerous attempts have been made to cultivate them, and to prepare the fibre in large quantities for commercial purposes. The plants are exceedingly easy of cultivation, and thrive in all soils, but preference should be given to those of a light loamy character. It is essential that the climate be moist and stimulating, in order to produce abundant and frequent crops of stems. The plants may be raised from seed, but the more ready method is by root or stem cuttings. The roots being perennial, the stools become stronger and more vigorous every year, and from these, fresh sets are easily obtained for extending the cultivation.

Numerous attempts have been made during the last 10 years to extract the valuable fibre which exists in this plant. The experimental processes hitherto employed may be briefly classed as either mechanical or chemical. In the first, it has been sought to extract the fibre from the green stems, by means of rapidly revolving beaters attached to a drum driven by steam power. In some cases, water is used to wash the fibre while under the beaters. The chief difficulty experienced in this method, is the small quantity of fibre cleaned per day. This has enhanced the cost to such an extent, as to render the process practically unremunerative. In the chemical processes, the Ramie stems are treated green or dry. The object sought is to treat the stems either under great pressure with steam or with chemicals, so as to dissolve the gum in which the individual fibres are immersed. After being thus treated, the fibres are easily detached from the stems by hand or by machinery, and are sent to market in the form of ribbons. The question of cost is here also very important, and it is felt, under present circumstances, that China Grass can only be satisfactorily grown and prepared where there is an abundance of cheap labour.

It is a fact universally known, that the fibre of the China Grass is one of the finest and strongest known. If a process could be devised that would extract and clean the fibre at a cheap rate, the results would prove of the greatest possible interest to all our tropical colonies. The China Grass plant can be grown as easily as the sugar cane, but in spite of many years of continuous effort, the problem how to prepare the fibre on a large scale, and place it in the market at remunerative rates, is apparently still unsolved.

We gather from the numerous applications made to Kew for information, that interest is still maintained in the China Grass or Ramie, and under these cirumstances it is felt to be desirable to place on record the latest facts that have been gleaned respecting the present position of the industry.

ROYAL GARDENS, KEW, to FOREIGN OFFICE.

SIR, Royal Gardens, Kew, April 16, 1888.

I AM desired by Mr. Thiselton Dyer to inform you that considerable interest is being taken in British Colonies in the culture of the Ramie plant, known as Rhea and China Grass (*Boehmeria nivea*).

2. Hitherto the industry has not assumed large proportions anywhere, owing to the want of a thoroughly suitable machine to prepare the fibre.

3. In the Foreign Office Report, for the year 1887, on the agriculture of the Barcelona district [No. 275, Annual Series, 1888], Mr. Consul Wooldridge states, that in the province of Cataluña, "Machines are "already in use, capable of decorticating the [Ramie] fibre on a "profitable scale."

4. Mr. Thiselton Dyer is of opinion that it is very desirable to obtain from Mr. Wooldridge the names of the makers of the machines which appear to have successfully solved the problem of decorticating Ramie stems. Any particulars he could add as regards the cost of the machines, the power necessary to drive them, and the out-turn of clean fibre per day, would prove of the greatest possible interest to planters in our tropical countries.

I have, &c.,
Sir T. Villiers Lister, K.C.M.G. (Signed) D. MORRIS.

MR. CONSUL WOOLDRIDGE to the MARQUIS OF SALISBURY.

MY LORD MARQUIS, Barcelona, April 25, 1888.

I HAVE the honour to acknowledge the receipt of Sir James Fergusson's despatch, of the 19th instant, on the subject of the machines used in Cataluña for decorticating the stalks of the Ramie plant; and I am directed to report to your Lordship the names of the makers of the machines, and to give any further particulars which might prove of interest to planters in British tropical colonies.

Although the Ramie plant has been cultivated for many years in the north of Cataluña, it is only within the last two years that, through the invention of a decorticating machine by a Monsieur Favier, member of the "Société La Ramie Française," it has been brought before the public. M. Favier has a factory, called the "Fabrica Favier," at Torroella de Montgri, in Gerona, in the vicinity of the Ramie plantations, where his decorticating machines are at work.

These machines are used to decorticate the stalks in a dry state, after having been cut and exposed to the powerful rays of the sun for 48 hours, as experiments and practice show that the operation on the green Ramie is impracticable.

It appears that M. Favier has been the first to solve the problem of decorticating Ramie with success; and, according to Professor Obiols his machine leaves nothing to be desired; and of this invention the "Centralblatt," of Berlin, in its number of January 23, 1883, says:— "Although the use of the Ramie, as a textile plant, dates from time

" immemorial, the separation of the fibre from the stalk has been found " hitherto so surrounded with difficulties that no hope existed of any " considerable extension in its use; however, since M. Favier has discovered a machine for the purpose of separating the fibre, a real revolution has been produced in the industrial world, and the cultivation of " the Ramie plant has taken extraordinary proportions."

Another decorticating machine, similar to the Favier one, has, however been invented by a Monsieur Billion, of Marseilles, who obtained a patent for it in Spain, but, being considered by M. Favier as a piracy, the latter prosecuted M. Billion, who eventually came out triumphant; and, although this machine has not been used in Spain, some persons consider it to be superior to the Favier one.

Full descriptions are given of these machines in Professor Obiols' pamphlet (in Spanish), and can be purchased for a few pesetas.

The Billion machine can produce 300 kilogrammes of fibre a day, showing an advantage over the Favier one.

The Favier machine is not for sale to the public, the inventor preferring to establish factories near the plantations and purchase the produce from the agriculturists, and decorticate and manufacture threads, &c., himself, as the " Société La Ramie Française " is doing at Torroella. Neither, I believe is the Billion machine to be acquired for money.

There is another machine, known as the " Agramadera (flax-dresser) Kaulek," invented by M. Kaulek, of Paris. Its size is a cubic metre, and it requires half a horse-power to put it in motion, and can be worked by the arm, by a windmill, or by steam. It is portable, weighs 350 kilos., and its price is 2,000 fr. (80*l.*) It has been known to produce 175 kilos. of commercial Ramie, in ribbons, in 10 hours.

Another machine has been invented in Barcelona by Don Demetrio Prieto for extracting fibre from textile plants, and many of his machines are in use, with success, in Mexico. The inventor is about to introduce certain modifications in this machine, in order to adapt it to the decortication of the Ramie plant.

The personnel required to work the Favier machine, and the cost per diem (in Cataluña), are as follows:—

	Pesetas	c.
Two men to separate the extremities of the stalks -	0	75
One man to introduce the stalks - - -	1	50
One man to receive the fibre - - -	1	50
One man to supply the stalks to the introducer -	0	75
	5	25

or about 4*s.* per day for each machine; and for, say, a 1,000 kilos. of dry stalks the proportional out-turn would be as follows:—

50 kilos. of extremities, or 5 per cent. of the whole weight.
190 kilos. of fibre, or 20 per cent. of the whole weight.
570 kilos. of wood.
100 kilos. of pellicles, and
90 kilos. of loss.

Yet the wood, extremities, and pellicles may all be utilized.

Taking the working of 20 of Favier's machines, which would require about 10 horse-power of steam, the expenses and profits result as follows:—

Cost of installation, 120,000 pesetas, or francs, each machine costing 6,000 fr., with the necessary capital of 60,000 fr.

Actual cost of stalks of Ramie (in Spain), 100 pesetas per 1,000 kilos.; and each machine decorticating 216 kilos. per day.

Expenses.

	Pesetas	c.
4,320 kilos. of stalks	432	00
Labour	108	00
Incidental expenses	122	00
Total	662	00

Products.

	Pesetas	c.
5 per cent. of extremities	10	80
20 per cent. of decorticated stalks, or 864 kilos. of fibre	864	00
57 per cent. of wood	61	50
10 per cent. of pellicles	17	20
9 per cent. of loss.		
Total	953	50

	Pesetas	c.
Total products	953	50
Total expenses	662	00
Clear profit - per day	291	50

or 117,150 pesetas per annum of 300 days of labour, which represent approximately 48 per cent. of the capital.

The Favier machine has the advantage of extracting the fibre and making the threads clear of gum, for in the raw Ramie which comes from China and India, there is so much gum that it is most difficult to cleanse. These machines, as I said before, are not yet within the reach of agriculturists, that of M. Favier being used by the inventor, and that of M. Billion having ceased to work in Spain.

I have, &c.,
(Signed) Frank Wooldridge.

L.—BOTANICAL STATION AT LAGOS.

In the *Kew Bulletin* for the months of June and July 1887, there were discussed the details of a scheme of botanical stations for the West India Islands. These botanical stations are intended to supplement the operations of the botanic gardens already established in the larger islands, and are simple and inexpensive agencies, chiefly devoted to the work of raising and distributing useful economic plants, and to cultivating experimentally on a small scale such vegetable products as offer the most convenient and suitable means for improving local industries. Botanical stations, as distinct from botanical gardens, are intended to be supervised by working gardeners, native or European, who have been specially trained in the details of nursery work in the tropics.

Profiting by the experience gained in the West Indies, it has been sought to extend the system of botanic stations to the West African Colonies, which hitherto have been without a local botanical agency of any kind.

The prosperity of these colonies has chiefly depended on palm oil, ground nuts, and various forest products, more or less of a precarious character. These are just now in a depressed state, and hence it is felt that some effort should be made to encourage the growth of coffee, cacao, maize, indigo, rice, cotton, ginger, india-rubber, cocoanuts, tobacco, and any other plants suited to the soil and climate.

Captain Moloney, C.M.G., the present Governor of the Colony of Lagos, has given considerable attention to West African products. He has been in correspondence with Kew for many years, and contributed numerous specimens to the museums, as well as dried plants for purposes of determination. Recently, Captain Moloney has published a work on the forest products and economic plants of West Africa, which is a valuable summary of information relating to the flora of tropical Africa.*

The principal West African Colonies are the Gambia, Sierra Leone, Gold Coast, and Lagos. The extent of these Colonies may be estimated from the fact that coast line of the Gold Coast Colony alone is 350 miles, and that the total area of the British Protectorate is from 24,000 to 30,000 square miles. The staple products of this Colony are palm oil and palm kernels, but among other exports are copra (from the cocoanut palm), guinea grains, gum copal, camwood, and beniseed. If once the natives inhabiting magnificent lands in this Colony were taught to cultivate economic plants in a systematic manner for purposes of export, the material wealth of the Gold Coast might be enormously increased.

Sierra Leone is a settlement with a coast line of about 180 miles, and an area of about 3,000 square miles. Agriculture is generally neglected, and the inhabitants are mainly supported by the trade which passes through the Colony from the interior. An effort has been made to establish a botanical station and model farm near Freetown in connexion with a botanical society, of which the Hon. S. Lewis is secretary. The finances of the Colony appear not to justify direct action being taken by the Government, but it is evident that, without official support, the aid of a skilled gardener, and regular supplies of seeds and plants, the results attained will not have an appreciable effect upon the welfare of the settlement.

The Gambia is a comparatively small settlement, the total area being about 69 square miles. The chief exports are ground-nuts, rice, maize, palm kernels, and india-rubber.

The Colony and Protectorate of Lagos contains an area of about 1,071 square miles, and an estimated population of 100,000. It was separated from the Gold Coast Government in 1886, and erected into a separate Colony with Captain Moloney as the first Governor.

Lagos has unrivalled water communication with the interior, and a very extensive trade has therefore grown up, amounting to nearly a million and a quarter sterling annually. The exports are palm oil and kernels, gum copal, cotton and guinea grains. This Colony, possessing excellent soil on the mainland, and good communication with the interior, offers every inducement to the extension of native cultures.

The first botanical station on the West Coast of Africa could not be better placed than at Lagos, nor entrusted to more sympathetic hands than those of Captain Moloney. On the occasion of the latter's visit to this country last year, he prepared a memorandum on the subject for the approval of the Secretary of State. This memorandum was based on that already adopted for the West Indian Colonies, but modified to suit the special circumstances of West Africa.

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* Sketch of the Forestry of West Africa, with Particular Reference to its Principal Commercial Products. By Alfred Moloney, C.M.G., of the Government of the Colony of Lagos. (London: Sampson Low, Marston, Searle and Rivington, 1887.)

MEMORANDUM prepared by CAPTAIN MOLONEY on establishing a Botanic Station at Lagos.

The experiment as an Executive act may be left, in the first instance, to the Governor, or it may be deemed expedient to pass an Ordinance to make provision for the establishment at Lagos of a botanic station for the development as an industry of its economic botany.

Objects.

The growth of specimens of indigenous trees and plants of marketable value (or likely to prove so) that may serve on development as visible means of instruction to the natives of the Colony and of the interior kingdoms who visit the Government from time to time.

A practical agricultural school to be the means of diverting some of the young blood of the country in the direction of agricultural pursuits, and so lessen the general tendency of the rising educated youth to become 'merchants and clerks.'

An established centre for the introduction and subsequent development of alien elements of economic botany of commercial importance elsewhere.

A nursery for economic tropical plants of commercial importance.

Such an enterprise must anticipate what commercial benefit may in a few years be brought about by the steady distribution of young trees of economic value among the chiefs and people of the many villages that border the net-work of water which permeates the Colony and its neighbourhood.

Superintendent.

A superintendent at a salary, with quarters, of from 100*l.* to 150*l.*, annual increment of 10*l.* No perquisites.

He should be trained in the general details of nursery work, and be acquainted with the methods pursued in the treatment of seeds, and for propagating plants by cuttings and slips, potting them in local earthen pots, and generally preparing them for distribution.

Gardener and Labour.

He would require under him a gardener at 30*l.* per annum, two labourers at 1*s.* per diem each. Potting and tool shed would represent an initial cost of 20*l.* Cost of tools and incidental expenses may be put down at 12*l.* per annum.

Again, quarters will have to be provided; total cost of service may be estimated at 300*l.*

Site.

The main features to be secured are good soil, comparative freedom from atmosphere impregnated with salt, good supply of fresh water on the spot, protection by hill or belt of trees against tornadoes or other strong winds, and accessibility either by water or by good road; enclosure, palm fence at first, later, a brick wall, as bricks can be made on the spot. For shading purposes, banana, plantain, and palm leaves can be had on the spot.

Management.

In an executive sense, for the present, this establishment should be deemed to be a branch of the Public Works Department, and be annually voted for as such.

Honorary Committee.

To ensure progressive management and healthy supervision, there should be an honorary committee of such gentlemen as the governor may appoint by the year, over which he himself would preside. The chief points that require attention as regards the supervision of the station are the regulation of working hours, the prompt treatment of seeds and plants immediately they arrive, the assignment of plants ready for distribution, and the due supervision of the station, so as to keep it in an efficient working condition for supplying the special needs of the Colony. A small charge, sufficient to cover the cost, may be made for all plants raised at the station, while for imports direct, the cost must be classed as incidental, and be charged accordingly.

Gratuitous Distribution of Plants.

Whenever it may be advantageous to the general interest, a gratuitous distribution may proceed under the authority in writing of the Governor.

Cocoa Nut growth in hands of Government.

Towards a future export of copra and coir, the development of the cocoa nut palm proceeds in the Colony of Lagos in the hands of the Government, whose lead has to some extent being followed by the natives.

Direction of efforts of Superintendent.

In addition to the points mentioned under "objects" in favour of the establishment of such an institution as is proposed, the efforts of the superintendent should be directed to the—

(*a.*) Promotion of extension of growth of the cocoa nut palm.
(*b.*) Introduction of a better class of cotton and its extended growth.
(*c.*) Culture of the naturalised tobacco, and improvement therein by importation of suitable seed.
(*d.*) Growth of ginger, cacao, pepper (red), and coffee.
(*e.*) Development of the rubber, gum, and resin tree, and of fibres.
(*f.*) Growth and judicious planting of Eucalyptus, Melaleucas, and the Casuarinas.
(*g.*) Model kitchen gardening.

I append a list, by the Assistant Director of Kew, of plants suitable for native culture in West Africa.*

Blind adherence to one industry only means commercial ruin, as was proved, to the cost of many, in some of our colonies. "Eggs-in-one-basket" policy has proved disastrous.

Publication of Proceedings.

To extend encouragement and to bring home a proper sense of responsibility, there should be rendered for publication in the Government Gazette quarterly, to the Colonial Secretary, a brief account of work done, embodying acknowledgment of receipts into, and issues from the station.

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* Not published.

Apprenticeship of Refugee Boys.

Further, as to the establishment suggested, I would remark, that in addition to the staff proposed, refugee (ex-slave) boys might be apprenticed under Government for such agricultural training as the station will offer, and I hope that, after the conference I mean to have with the London Directors of the branch of the Hussey Charity established at Lagos, on the advisability of working their boys half-timers as regards the industrial work of the station, general benefit in such direction also may be derived.

Industrial Education of Sons of Chiefs.

I would venture also to urge upon the Government the desirability of utilizing such a centre for the regular education therein of three or four sons of important chiefs in or outside the Colony. Their maintenance would not cost much, say, 100*l.* a year, and could form an additional charge to vote "Aborigines." The result of such a policy would prove of great value to the country.

In drawing up this scheme, I have conferred personally with Mr. Morris, the Assistant Director of Kew Gardens, whose experience I have utilized in some measure, for which I must give him my acknowledgments. I am also again indebted to the Director.

In a scheme of this kind and extent, there must be many minor matters of detail that will present themselves later, and can, I think, be left with advantage in the hands of the Governor of the Colony.

At the request of the Secretary of State, the selection of a suitable man to take charge of the botanical station at Lagos was entrusted to Kew. The difficulty as regards the climate of West Africa and its unsuitability for laborious service on the part of a European gardener was solved by obtaining a creole gardener trained by the botanical department of Jamaica. Mr. James MacNair, the man appointed, had been in charge of the Hope Nurseries at Jamaica for seven years, and was highly recommended for his experience and knowledge of economic plants and the details of tropical agriculture. On his way from Jamaica to West Africa, he spent some time at Kew, and took out with him a Wardian case of plants and numerous packets of seeds with which to start operations at Lagos. In March of this year a further supply of seeds comprising 200 packages, obtained from the botanical gardens of Calcutta, Ceylon, and Jamaica, was forwarded from Kew to Lagos.

As indicating the nature of the duties in which Mr. MacNair is engaged at Lagos, the following extract from a letter received from him on the 12th January last, will be read with interest:—

"I beg to say that a great many of the seeds from Jamaica and Kew, " which I brought over with me, are doing well. I have them potted up in " bamboo pots. I shall be very glad to get a further supply of all kinds " of fruit and timber trees of the West Indies, such as Mahogany, " Cedar, Juniper, &c. I am glad to inform you that I have succeeded " in getting a few seeds of the No. 11 Mango and Black Mango, which " I took with me from Jamaica to grow, and I shall be able soon to " propagate plants from them by grafts. I find that the Guinea Grass " is very scarce; there are a few roots scattered about the country, but " of a coarse kind, like the St. Mary's Grass of Jamaica, but not known " in the country as a fodder for stock. Also the Guinea Corn is a very " poor kind. I would like much to have some good seeds. The plants " from Kew, which I have established in their permanent places, are "doing well. They look quite healthy, especially the Logwood, Annatto, "Divi-Divi, *Theobroma Cacao*, &c. I am still staying in the town of "Lagos, the station-house being not yet completed."

Again, on the 6th March last, Mr. MacNair wrote as follows :—

"I have been engaged during the last two months making a road "from the entrance to the Superintendent's house, seven feet in width, "and planted out with a border of Bahama grass, three feet in width, "and making up a couple of beds round the house for flowering and "ornamental plants, which will give the place a neat appearance. The "nursery is well sheltered with large fig trees, and in addition, I have "put up a shed covered with palm leaves for protecting the younger "plants. Our fence at present is a temporary one, made of palm "leaves, but I expect soon to have a good fence put up. I have "recommended a barbed-wire fence. My supply of water is not "enough for irrigation purposes, and only just enough for watering "plants. The river water cannot be used, as it is too salt, except in "the rainy seasons, when it is fresh. The Governor has supplied me "with a large quantity of Liberian coffee seeds, which have grown "very nicely. I am now potting them, and expect to get over 15,000 "plants, which the Governor intends to distribute amongst the "principal native men of the country. I have planted out a few of all "the different fruit trees which I have in stock, also a few Liberian "coffee and cacao, about the place as an experiment. The plants from "Kew are all in good condition, and doing well. The Logwood is fully "two feet in height, and I am now taking cuttings from it. Our "quarterly report is not ready for this mail, and will not be for a "couple of weeks. . . . I have got a good supply of botanical "books on hand; also the Kew Bulletin, sent me by the Governor, "which I am making use of. The wish of the Government is to "encourage the growth of indigenous trees and plants of marketable "value, so that they may serve as a visible means of instruction to the "natives of the country."

COLONIAL OFFICE to ROYAL GARDENS, KEW.

SIR, Downing Street, May 5, 1888.

I AM directed by the Secretary of State for the Colonies to transmit to you, for your information, a copy of a despatch from Captain Moloney, transmitting the first report on the botanic station at Lagos.

I am, &c.,

The Director, (Signed) R. G. W. HERBERT.

Royal Gardens, Kew.

[Enclosure.]

GOVERNOR MOLONEY to COLONIAL OFFICE.

SIR, Government House, Lagos, March 19, 1888.

IN reference to your despatches, No. 45, of April 7, and No. 144, of October 3, 1887, I have the honour to forward the first report on the botanic station of this Colony, viz., for the quarter ended December 31, 1887.

2. The work done up to the present time augurs well for its future usefulness and importance as a teaching centre and depôt whence may be spread information on the utility, value, and mode of culture of trees

and plants, and eventually a distribution of seeds and plants for cultivation among the natives effected.

4. The superintendent, Mr. J. MacNair, is a very good man for the post; a hard worker, with a sound, practical knowledge of his work, in which he takes a great interest. For his selection, as well as for supplies of specimen plants and seeds, the Colony is again much indebted to the Director and Assistant Director of the Royal Gardens, Kew, to whom I would ask you to be good enough to supply a copy of the report now transmitted.

I have, &c.
(Signed) ALFRED MOLONEY.

The Right Hon. Lord Knutsford.

REPORT on the BOTANIC STATION, LAGOS, for the Quarter ended 31st December 1887.

At the end of the first quarter of 1887, the Right Honourable the Secretary of State for the Colonies was pleased to approve of a scheme for the establishment, as a branch of the Government at Lagos, of a botanic station. The details of the scheme have been communicated to the local press, and appeared in the "Lagos Observer" of the 21st to 28th January 1888. To make a start and to have a suitable place for a nursery by the arrival of the superintendent, the house and compound at Ebute Metta of Bishop Crowther, admirably suited for the purpose, were put in order, and rented temporarily by the Government during September quarter. Mr. MacNair, who was selected in Jamaica for the post of superintendent, arrived with his family in the Colony on the 8th November 1887, and occupied his present quarters at Ebute Metta on the 19th January 1888.

Ebute Metta, on the mainland, was decided on as the most suitable site for such an establishment. The site there chosen offered the main features to be secured, viz., good drainage, being a slope down to the edge of the water-way, by which it is approached from Lagos in a quarter of an hour by steam launch, and half an hour by boat; a comparatively good soil; freedom from an atmosphere impregnated with salt, being over three miles from the sea; protected by a handsome belt of trees (figs) against tornadoes, which generally blow from N.W.; and accessibility by water. A public ferry plies also between Lagos and Ebute Metta, and is much and daily used.

The area of the land enclosed is 3¾ acres, which has been cleared and temporarily fenced in with bamboo and palm leaf fencing, at a cost of 11*l.* 15*s.* The work of grubbing, weeding, levelling, path-making, proceeds; steel-barbed wire-fencing has been ordered from England. This fence, when erected, is intended to have a height of 5 feet in eight strands, the four lower being placed close together to prevent sheep, &c, from entering the garden, and supported by mangrove posts, which resist the ravages of the white ant.

As regards accommodation, there were two houses with out-buildings on the site, one of which has been repaired at a cost of 124*l.* 12*s.* 3*d.*, including out-buildings. This now represents the residence of the superintendent. The out-buildings include potting and tool-room; but the shelter of the avenue of figs, referred to in a previous paragraph, presents a capital open-air potting room and nursery, and one which is preferred. The second house is now undergoing repair at an estimated cost of 76*l.*; it will contain the superintendent's office, remaining accommodation being intended for gardeners and apprentices. Both houses were in a dilapidated condition, the latter particularly so.

Two wells have been dug at a cost of 6*l.* 5*s.*, about 23 feet deep each, and give a depth of good water of about 2 feet 6 inches. In time they are to have pumps and water-butts fixed alongside.

The present *employés* under the superintendent are represented by two sub-gardeners and two labourers.

It is intended in time to take in a limited number of day scholars to learn practical gardening, when it is to be hoped educational bodies and parents will take advantage of the arrangement.

A small botanical library has been supplied for the use of the superintendent and apprentices.

In the quarter ending 30th June 1888, plants will be available for distribution by sale at a very low rate, and otherwise; a list will be from time to time published.

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ROYAL GARDENS, KEW.

BULLETIN
OF
MISCELLANEOUS INFORMATION.

No. 19.] **JULY.** **[1888.**

LI.—BHABUR GRASS.

(*Ischæmum angustifolium*, Hackel.)

This grass, which closely approaches esparto in habit and in the possession of the technical qualities necessary for paper manufacture, was first brought into notice by Dr. King in the Annual Report of the Royal Botanic Garden, Calcutta, for the year 1877-78. It was there confounded with an entirely distinct plant, *Eriophorum comosum*, a species of *Cyperaceæ*, with which it often grows intermixed, and from which, as it rarely flowers, it is hard to distinguish. This error appears to have originated with Royle, who (Illustrations, p. 415) identifies *Bhabar* with *Eriophorum comosum* var. *cannabinum*. It was referred to in the Kew Report for 1878, p. 45, as follows:—

"*Eriophorum comosum*.—This plant is well known in North-Western " India, where, under the name of *Bhabar-ghas*, it is largely used as a " material for ropes. It was submitted by Dr. King to Mr. Routledge " (of the Ford Works, Sunderland), who writes to us:—'A small " 'quantity of bleach brings it up to a good colour. The ultimate " 'fibre is very fine and delicate, rather more so than esparto, and of " 'about the same strength; the yield, however, is 42 per cent., some- " 'what less. I think I may venture to say that it will make a quality " 'of paper equal to esparto.'"

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1888.

Price Twopence.

In the following year Mr. Duthie, Superintendent of the Government Botanical Gardens, Saharunpur, sent a specimen to Kew for identification. He wrote, May 2, 1879:—

"I am sending a specimen of a Cyperaceous-looking plant, which I " have been asked to identify. It is a native of the Nepal Terai, and " in the district of Gorakhpur, at the extreme east of these provinces. " Its native name is *Bankas*, and it is largely used in making ropes, " &c. It has been sent to me three times, but on each occasion " without flowers. It is said to flower only once in three years."

This recalled a grass which, under the name of *Bunkuss* appears, from the Bengal Catalogue of Indian products, to have been shown at the London Exhibition of 1862 (section 1, pp. 137, 168), as used in N.W. India for making ropes.

Mr. Duthie's specimens, though extremely imperfect, were submitted to the late General Munro, C.B., F.R.S., in the hope that his incomparable knowledge of grasses might enable him to ascertain what it was. He succeeded in identifying it with *Spodiopogon angustifolius* (Trinius in Act. Petrop. vi., ii., p. 300; Spec. Gram., t. 336). He added:—"It is *Andropogon involutus*, Steudel, and *A. notopogon*, " Nees and Steudel. It is mentioned by name only as *Spodiopogon* " *laniger* in Royle's Illustrations (p. 416). It is very common in all " parts of the Lower Himalayas; and I have seen it from Afghanistan, " collected by Griffith."

Mr. Duthie subsequently informed us that it was also known under the name of *Bhaib* grass, and that it was used for the manufacture of string matting and a variety of other articles, of which a fine collection was sent by him to the Kew Museum in 1880 (*see* Kew Report, 1880, p. 60).

We were indebted to Sir Dietrich Brandis, K.C.I.E., late Inspector-General of Forests to the Government of India, for pointing out that the grasses variously known as Bhabar, Bhaib, and Bankas were all identical. The following note upon the subject is contained in a paper entitled "Suggestion regarding Forest Administration in the " N.W. Provinces and Oudh" (Calcutta, 1882, pp. 7, 8):—

"The export of the grass known as Bhabar, Bhaib, Bankas " (*Andropogon involutus*, not as has often been erroneously stated, " *Eriophorum comosum*), from the Siwalik Hills, and from tracks of " broken raviny ground outside the Hills, is very considerable. . . . " The grass grows abundantly on dry bare slopes, and no apprehension " regarding the sufficiency of the supply need at present be entertained. " It is used chiefly for rope-making, and it is by no means impossible " that the establishment of paper-mills in North India will eventually " lead to the employment of this grass for the manufacture of paper."

Early in 1883 the India Office furnished us with a copy of a report by Mr. C. E. Edwards, the manager of the Lucknow Paper Mills, to the Director of the Department of Agriculture and Commerce of the North-West Provinces and Oudh, which contained the following observations with respect to the use of Bhaib for paper making:—

"This grass we have used here, but not to any great extent, owing " to the price being too high, besides the out-turn is not so great as " with jute. I found it not to yield more than about 35 per cent. of " paper. This is to a great extent owing to the top part of the " plant being somewhat perished, I presume owing to the tops being " more exposed to the atmosphere, as this part appears to get ripe " much earlier than the bottom. In the process of boiling the perished " or top part gets destroyed before the bottom part of the stem gets " sufficiently reduced to a pulp. This accounts for the great loss in the

" manufacture, but this could be obviated by having the top parts cut " off before despatching it to the paper mills, and if it could be had at " the same price with the tops off, I have no hesitation in saying it " would be a good and cheap enough fibre for paper-making purposes."

Dr. King, in his annual report for 1882–3, summed up its prospects as follows :—

"In several former reports I have referred to the leaves known by " the vernacular name *bhabur* as the produce of *Eriophorum comosum.* " I have now satisfied myself that the bulk of the *bhabur* used by " natives for rope-making is not derived from *Eriophorum,* as I have " supposed, but from *Andropogon involutus.* This grass, I find from " inquiry locally made, abounds in the hill parts of Behar and Chota. " Nagpore, where it is known as *Sabai.* From these regions it can be " obtained in quite considerable enough quantity to make its utilization " as a paper material a feasible project, and the people who actually " collect it sell it a reasonable enough rate. But in order to get it " brought to Calcutta in sufficient quantity for local manufacture, or " for shipment to Europe, middlemen have to be employed, whose ideas " of profit are pitched so high that, until they become modified, the " utilization of *bhabur* must remain in abeyance. This is only in accord " with the common experience in the Mofussil, that competition in " trade is not sufficiently keen to have much effect in keeping down " prices, but that, on the contrary, traders still form guilds banded " together to enhance prices, even at the risk of choking off demand."

On December 1, 1883, the late Mr. Thomas Routledge, who was always ready to assist us by making experiments on new paper materials, privately reported, as the final result of his trials of Bhabur grass :—

"I believe it will make a fair sheet of paper, much the same as fine " esparto; in fact, in many respects, as a natural product, it closely " resembles esparto, but does not contain so much glutinous and " amylaceous matters, nor so much silica. The sample sent, you will " remark, was cut, and not pulled from the roots as esparto is. Like " esparto, *in situ* it is worth very little, and is used for similar purposes, " roping, matting, baskets, &c. The cost of esparto consists in " collection, carriage to port of shipment, and, latterly, baling charges, " freight to England, &c. Whether from India, with long and " probably costly inland carriage, with heavy freight added, it can " come into competition with esparto, is doubtful, and I do not think it " would pay to convert it into stock."

The prospect of utilizing the grass would be no doubt improved if it could be cultivated. From the following account by the Rev. H. P. Boerresen, of Rampore Hât (printed in the Proceedings of the Agricultural and Horticultural Society of India for October, 1887) it appears that this is readily practicable.

"(1.) The Sabai or Babui grass yields two crops in the year, one in " September, and the other at the end of October, or early in November, " without any irrigation, as the rainy season is then prevalent. It " might yield a third cutting if irrigated ; but I cannot say anything on " this head, never having made the experiment, nor have I seen it " attempted by others.

"(2.) I believe it will grow anywhere, as we have transplanted it " from here to all our other out-stations in the Santhal Parganas, and it " thrives in them all. The Santhal Christians have also taken some of " it to our Christian Colony in Guma Duar, Assam, where it also " grows well.

"(3.) I have never attempted to propagate it by seed, but always by " roots. When a clump or tuft is dug out, it may be divided into as " many small divisions of roots as one pleases, and these are put down " again in rows about three feet from one another, and the same " interval between each root planted. It will yield a very trifling " return the first two years, but by the third or fourth year, when the " roots have spread and multiplied, it gives a *good* crop. The plot on " which it is planted must be kept free from other grass. When it is " seven or eight years old, the roots should be beaten down with " wooden mallets, or a plough should be run through them in every " direction, and fresh earth thrown over the whole increases the yield. " If not treated in this way, it will cease yielding any crop. When " grown too old, it must be taken up entirely, re-divided in small " bunches of roots, and transplanted to a fresh locality.

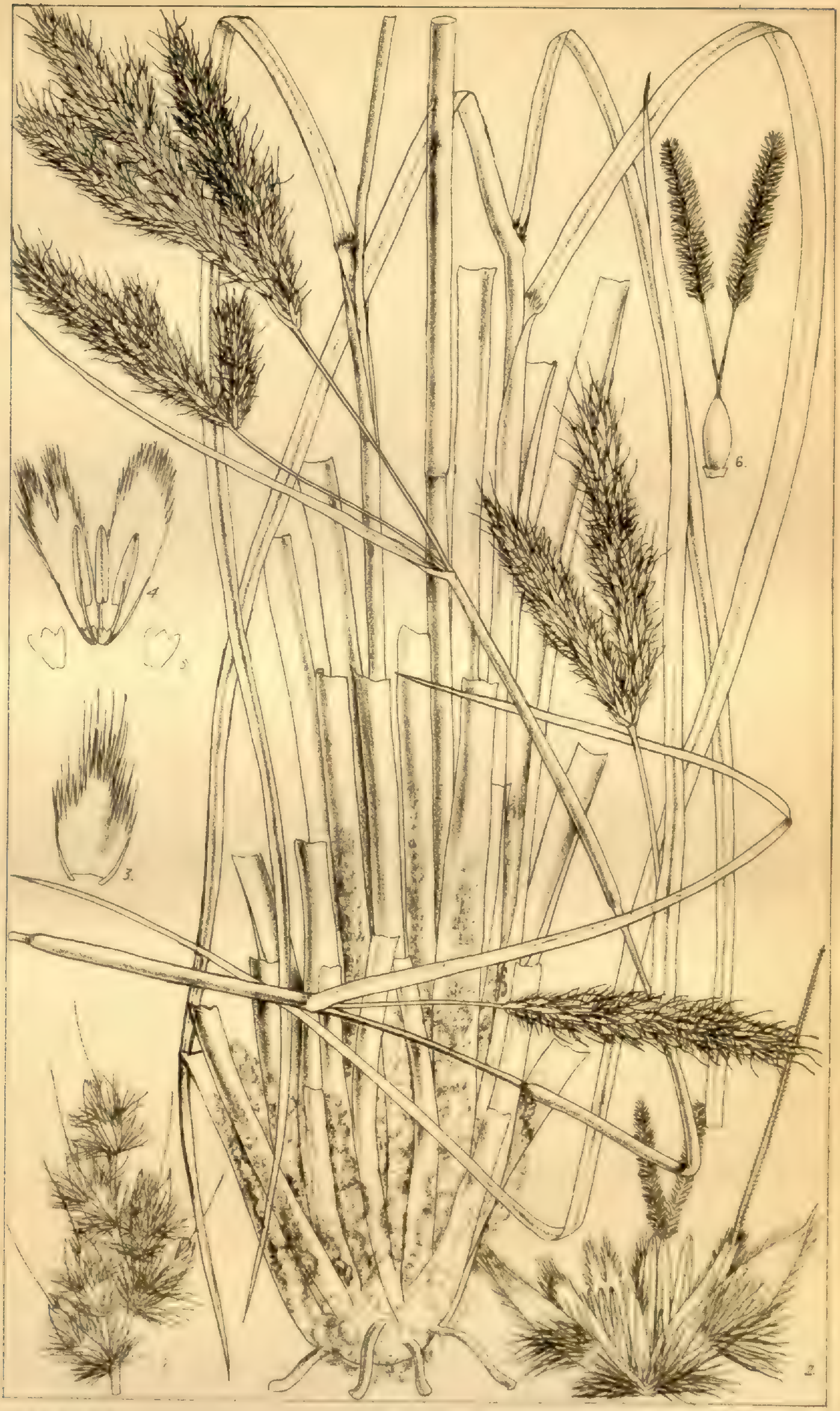
"(4.) We brought the grass always in local *hâts* for roofing purposes " (*as rope*) before we grew our own, and nowhere in our neighbourhood " am I aware of its being cultivated in any but very small patches by a " solitary man here or there. It is not cultivated as a source of income " or trade, so that I am unable to say where the roots may be bought, " or at what price. We got a small quantity of the roots originally " from a Hindu village, but by fostering and spreading their cultivation " have now a considerable quantity. It should be planted in a *dry* " spot, where no water lodges, as experience has shown in one of our " stations, where the water oozed up from below and rotted the roots, " that it would not grow there. A sloping site is probably the best.

"When we first started the mission here we had to pay Rs. 4 a " maund in the *hâts* for the grass, in order to twist it into rope or " string, and it was the having to pay so much that led me to try and " cultivate it ourselves. The grass runs to seed in the hot months, shortly " before the rainy season, but these must be cut off and removed, or the " crop will deteriorate."

Besides a great variety of native names, Bhabur grass has, from the difficulty of exactly ascertaining its affinities, received an almost equal number of botanical ones. Under the name of ***Pollinia eriopoda***, it is discussed in the Journal of the Linnean Society (vol. xx., pp. 409, 410), and it is figured and described in Hooker's Icones Plantarum (tab. 1773) as ***Ischæmum angustifolium***, the name finally assigned to it by Hackel, the most recent monographer of Grasses. To the courtesy of the Bentham Trustees, we are indebted for the use of the accompanying plate.

LII.—CAYMAN ISLANDS.

The Cayman Islands consist of the Grand Cayman, Little Cayman, and Cayman Brac. They are situated in the Caribbean Sea, about 200 miles to the West of Jamaica, and are included under the Government of that Colony. Grand Cayman is 17 miles long, and varies in breadth from 4 to 7 miles. The coast is in some parts bold and rock-bound, but with no elevation exceeding 150 feet. The island is described as well wooded in parts and producing dyewoods and mahogany. The cultivated products of the soil are similar to those of Jamaica, and consist of cocoa-nuts, sugar cane, and ground provisions. Amongst the curiosities of Grand Cayman are a cave at Bodden Town, which extends some hundreds of yards under the sea, and a natural cistern of unknown depth, containing clear, sweet water, at a locality called East End. This cistern measures



M.S. del et lith.

Ischaemum angustifolium. Hack.

about 50 feet across, and is situated in the middle of a cliff of flinty rock.

Little Cayman is 9 miles long and about a mile broad. Cayman Brac is 10 miles long, and about a mile broad. Both these islands lie in a north-easterly direction from Grand Cayman, and distant about 70 miles.

The Cayman Islands are so far out of the regular traffic of steamers that they are seldom visited. The present population of Grand Cayman is about 4,000. Little Cayman contains only 35 inhabitants, while the population of Cayman Brac is said to be about 300 whites and 30 blacks.

It is a remarkable characteristic of the inhabitants of these tropical islets that they are a temperate, strong, tall, healthy-looking people, chiefly white or coloured. They are doubtless descended from the original settlers of the last century. The proportion of black people (negroes) is comparatively small.

The present Governor of Jamaica, Sir Henry Norman, has twice visited the Cayman Islands. On the occasion of his more recent visit [May 1888] he was accompanied by Mr. William Fawcett, F.L.S., Director of the Botanical Department, whose mission was specially connected with an investigation into a disease which has existed for some time amongst the cocoa-nut palms at Grand Cayman.

We understand that Mr. Fawcett is at present engaged in the preparation of an official report of his visit. In the meantime the following extract from a letter just received from him will afford a first impression of the vegetable resources of these lonely and little known islands :—

Jamaica, 21st May 1888.

I have just returned from a visit with the Governor to the Cayman Islands. We left Jamaica on 7th May, and reached Grand Cayman on the evening of the 8th. The next morning I went on shore, but the rain came down in such torrents that I could not do much. On the 10th I went about seven miles along the coast to the north, examining cocoa-nut palms at various places that were diseased. The next day I went along the south coast about 15 miles and back the same day, and had several diseased cocoa-nut palms cut down for examination. On the 12th I went inland about 2½ miles to the Sound, a shallow lagoon which runs in from the north side of the island, and on Sunday, 13th, did the same. On the 14th we left Grand Cayman, and touched at Little Cayman, landing for a short time, and then went on to Cayman Brac. There are very few people at Little Cayman, about 40; but at Cayman Brac there are between 400 and 500 inhabitants, living by fishing and cultivation of "ground provisions" (yams, &c.) and bananas. Cayman Brac exports a large number of cocoa-nuts, as much, I was told, as 600,000 to 800,000 annually. The shore is lined with cocoa-nut palms, and there is no disease. A very great number of nuts are, however, destroyed by rats.

Grand Cayman is surrounded by coral reefs, and the shore vegetation is what is usual in such places, but at a short distance from the sea there are signs of an indigenous flora, which would well repay detailed examination. My special work being to inquire into the agricultural products of the islands, I could not devote much time to collecting, and such specimens as I have brought back home have suffered a good deal from want of proper facilities for drying, &c. However, as soon as they are dry I will send them to Kew for determination. I found two orchids, which are well worth cultivating, if you have not already got them. One is a species of *Aëranthus*, like *A. funalis*, but larger and finer, I think. The other is a species of *Schomburgkia*, near *S. crispa*, but the lip is purplish, not pink red. I enclose flowers only for the present, and if you like I will send some of the living plants, as well as dried specimens.* From what I saw of the interior the soil appeared to be formed by the disintegration of limestone, this red clay and the limestone rock being of the same character as is found to such an extent in Jamaica. Wherever, therefore, it is of any depth it is suitable for cultivation. Mangoes grow well, but they are said not to be so good as some of the Jamaica fruit. Oranges, both sweet and bitter, and a few lemons are produced, and great quantities of limes are exported pickled. Yams, cocoes, sweet potatoes, cassava, pine apples, melons, sugar canes, bananas, guinea grass all grow well. I took a few good pine apple suckers with me, which they were glad to have. The sugar cane looked poor, but they said that it was due to long-continued drought, and that canes grow sometimes from 12 to 15 feet in height. There are a great number of papaw trees, some with thick trunk and several branches; the fruit is usually large. There is a good deal of logwood, fustic mahogany, and hard-wood timbers, which would appear to prove that the island is something more than a mere coral reef. The people are excellent shipbuilders, and use their native mahogany and other hard timbers in the construction of schooners up to 50 tons, but the planking is now at least imported from the States. These hard-wooded trees grow on the north side, but as it was doubtful whether I could go and return in one day, I had to abandon a projected visit. I was sorry, also, not to see the cultivation there, as I heard that the soil was the richest in the island and more cultivation carried on than elsewhere. *Furcræa cubensis* grows, and I believe some attempt has been made to extract the fibre. The Jamaica Keratto (*Agave Morrisii*) is plentiful on all the islands. I saw two trees of coffee growing not far from the sea, and though they were close up to the house, and not pruned, the crop was not a poor one, considering the previous drought. This was probably the first attempt to grow coffee in these islands, and I think that the result justifies planting. The guava and the coco plum grow wild, as in Jamaica.

In little Cayman there is mahogany, but no cedar (*Cedrela odorata*) and in Cayman Brac there is plenty of cedar and scarcely any mahogany, In little Cayman there is no logwood nor fustic ; at least I was told so by the inhabitants, and I met with none. On Cayman Brac I found fustic growing in the woods, but logwood was said not to grow. The interior of Cayman Brac, within the fringe of coral beach, where the cocoa-nut grows, is limestone, disintegrated into hollows which make walking very difficult and dangerous. Wherever sufficient red clay exists provision grounds are made, where the usual "ground provisions," bananas, and pine-apples are grown.

There are considerable deposits of phosphates in these islands, which are being worked at the Grand Cayman.

At Grand Cayman the disease in the cocoa-nut palms appeared somewhere about 15 years ago, and spread throughout the whole island, killing off every single tree. Seed was imported from the mainland, and the inhabitants have been persevering ever since in their efforts to re-establish the former flourishing cocoa-nut walks. Sometimes the trees die while they are quite young, and sometimes a crop is produced and then the tree is attacked. The disease is quite independent of wind, travelling as often against it as with it, and attacking often the finest trees in a walk. The outer leaves first show signs of the disease, gradually turning yellow; but I invariably found that it was the bud leaves which were affected first at the apex, and as the disease gained ground the outer leaves lost their green colour. Sometimes on cutting the stem right through just above the ground it appeared perfectly untainted and smelt and tasted sweet. At other times, when the disease had made more progress, though the stem section looked white, it smelt and tasted sour, and this occurred even when only the upper portion of the "cabbage" was discoloured. The discolouration was a purplish black, eventually becoming quite black. There was a sour smell as of fermentation in the "cabbage," and, considering all the circumstances, I believe that the disease is due to a bacterium. I had no suspicion of this before starting, as I was told that the disease was the same as the Jamaica scale insect; but even if I had taken material for the purpose of examination, there was not sufficient time to do anything. I have brought back small species in alcohol (diluted), but have not yet examined them under the microscope. The disease is evidently not caused by an insect, but after the disease has taken hold of the tree, and decay has set in, various insects may be found, such as ants, a small beetle (called the cocoa-nut fly), and white larvæ, which may be the cocoa-nut fly larvæ. I did not see a trace of the Jamaica beetle or the scale insect.

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* From an examination of these flowers at Kew, it appears that the *Schomburgkia* is *S. Thomsoniana*, Reich. f., Gard. Chron., 3rd Ser., vol. ii., p. 38 [1887]. The locality of Professor Reichehbach's plant is not stated. The other orchid is probably a new species of *Dendrophylax*, near to the Jamaica plant *Dendrophylax* (*Aëranthus*) *funalis*, Grisebach Flor. Brit. W. Indies, p. 625, but the flower is larger and the spur much longer.

W. FAWCETT.

LIII.—VALONIA IN CYPRUS.

The following correspondence has passed between this establishment and the Crown Agents for the Colonies on the subject of acorns shipped to this country by the Government of Cyprus as Valonia:—

ROYAL GARDENS, KEW, to THE CROWN AGENTS.

Royal Gardens, Kew,
June 4, 1888.

GENTLEMEN,

I HAVE the honour to acknowledge the receipt of your letter of May 25th, with enclosures (herewith returned), and accompanied by three samples of acorn-cups sent from Cyprus as Valonia.

2. This important tanning material is in large use in this country, as much as 30,000 tons having been imported in 1885. It consists of the acorn-cups of the Valonia Oak, *Quercus Ægilops*, L., and the commercial supply is derived apparently exclusively from Greece and Asia Minor. Valonia from these two sources is commercially distinguishable, and they are produced by distinct local forms of the Valonia Oak.

3. The acorn-cups sent from Cyprus are not Valonia at all, and do not in any way resemble it. One of the samples, in fact, consisted merely of the acorn-cups of the Holm or Evergreen Oak, so commonly planted in this country. I am afraid there is not much prospect of finding any commercial use for these acorn-cups; but Mr. W. N. Evans, of 66, Stackpole Road, Bristol, takes much interest in possible sources of new tanning materials, and I think if samples were sent to him he might be disposed to see if any use could be found for them.

4. In writing to the Colonial Office, April 20th, 1881, I pointed out that Gaudry, in his report on Cyprus to the French Government, expressed his astonishment not to meet with the Valonia Oak in the

island. It could probably be very easily raised from seed, and the Government of Cyprus could hardly do a wiser thing than to raise and plant out year by year a stock of this valuable tree.

I am, &c.
The Crown Agents W. T. THISELTON DYER.
for the Colonies.

The CROWN AGENTS to ROYAL GARDENS, KEW.

SIR, Downing Street, June 16, 1888.

I HAVE the honour to acknowledge the receipt and to thank you for your letter of the 4th instant.

In accordance with your suggestion we have sent samples of the Cyprus acorn-cups to Mr. Evans of Bristol, and I enclose a copy of his report upon them, which we propose to communicate, with a copy of your letter, to the Island Government.

I have, &c.
The Director, E. E. BLAKE.
Royal Gardens, Kew.

[Enclosure.]

Mr. EVANS to THE CROWN AGENTS.

66, Stackpole Road, Bristol,
GENTLEMEN, June 13, 1888.

I AM duly in receipt of your favour of the 9th. The parcel with three samples of acorns came in due course yesterday. I have carefully analysed them, and beg to enclose copy of the analyses, by which you will observe that although they contain very small quantities of tannic acid, yet the per-centage is so small that they would not pay to ship. If my memory is correct, a cargo of some similar acorn-cups was brought into Liverpool a few years since, which was worthless, and thrown overboard in the Mersey. These cups are not Valonia, which is *Quercus Ægilops*, eight or ten times as large, and giving from 25 to 40 per cent. of tannin.

There is no reason why Valonia should not be grown on the island. Fresh *undried* acorns could be got from Smyrna, Aidin, or Borlo districts, or from the island of Rhodes, and no doubt the young plants would flourish there, if they were *enclosed* so that the goats and other animals could not get at them to destroy them. Valonia is and ever will be a precarious crop on the mainland from the insecurity of life and property. It grows on the high grounds to the north of Cyprus, and it might, with little care and attention, form a valuable addition to the products of the country. I would also mention that there is another tanning material, namely "Shumac" (*Rhus Coriaria*), which has been used by the natives in their tanning for centuries.

At the Colonial and Indian Exhibition I encouraged the Commissioner to export it to England in the Sicilian style. There is a very large demand for the best Palermo Shumac, but that is almost perfection. I believe a little encouragement, and the growth of the same kind of Shumac as that grown in Sicily (*R. Coriaria*) would produce the same results. Messrs. J. W. Williamson and Co., Limasol, have sent over some, but are rather discouraged by the lowness of the price, 10*s*. to 13*s*. per cwt.

I shall be pleased at any time to give information on tanning products, or analyse the same.

Yours, &c.
(Signed) W. N. EVANS.

ANALYSIS of ACORN-CUPS from the ISLAND of CYPRUS.

No. 1.—*Quercus Pfæffingeri.*

	Per cent.	
Tannin	0·80	
Organic acids	4·02	
Water	12·20	
Ashes	2·74	
Woody fibre	80·24	
	100·00	worthless.

No. 2.—*Quercus Ilex.*

	Per cent.	
Tannin	2·41	
Organic acids	4·42	
Water	11·44	
Ashes	2·30	
Woody fibre	79·43	
	100·00	worthless.

No. 3.—*Quercus alnifolia.*

	Per cent.	
Tannin	4·83	
Organic acids	5·63	
Water	11·32	
Ashes	2·41	
Woody fibre	75·81	
	100·00	not pay to ship.

(Signed) W. N. EVANS.

LIV.—PRICKLY PEAR IN SOUTH AFRICA.

Professor MacOwan, F.L.S., Director of the Botanic Garden at Cape Town, has obligingly communicated to this establishment a corrected proof of a memorandum prepared by him for the Department of Agriculture of the Cape Colony. This memorandum deals with the circumstances attending the rapid spread of one or more species of *Opuntia* plants, which are familiarly known in warm countries as prickly pears. These plants, native of the New World, are becoming increasingly abundant in all dry regions of the Old World. The land occupied by them is practically useless for all purposes of husbandry, and hence it becomes an important question economically how such plants may be effectually eradicated at a small cost, or, if it is not possible to eradicate them, how they may most conveniently be utilised as objects of productive industry.

Cape Town, 5th April 1888.

Confining what I have to say to experience in the districts of Somerset and Graaff-Reinet, there nevertheless exist, in many other places, large areas over which the prickly pear plant has spread during the last 50 years so as to become a serious difficulty. The courses of streams, and flats between their curvatures, have in many cases been completely over-run, and such places are generally abandoned in despair. Thus there was a noted thicket just below the Bruintjeshoogte pass on the road to Pearston, whose enlargement and increasing denseness I noted during about 10 years. The thicket on the site of the railway station at Cookhuis Drift, though not so large, was even more dense, and although the occupier of the outspan, previous to the construction of the line, laboured hard, during the many years I knew the place, to eradicate the plant, he could do little more than keep clear the area of his garden and mealie [maize] land. Even after the great clearance made, regardless of expense, by the railway department, I observed in 1886–7 that young Opuntiæ were springing up everywhere and bidding fair to recover the lost ground.

I do not think the ordinary means at the disposal of any farmer will be adequate to the extirpation of such concentrated masses of this plant. But where it occurs sporadically—here one, and there one—over the average surface of a sheep-farm, things are not so hopeless. Many enterprising men have, in the districts named, spent from 100*l.* to 200*l.* in one sum to clear their property, and find advantage in the outlay. Stock, I am informed, are apt to get under the lee of a thicket of *Opuntia* in cold windy weather, and, besides the mischief accruing (mostly to goats) from irrepressible nibbling of the needle-armed stem-joints, they are apt to receive in their eyes the spicules knocked off and carried before the wind, in which case violent inflammation, suppuration, and even total blindness may result.

So tenacious of life are the stem-joints, that mere hewing down is useless as a means of extirpation. Two out of three stem-joints cut away and left to chance will root on the side next the earth and start afresh. Remember, we are not here dealing with leaves, as is popularly supposed. The flat slab-like elements of the *Opuntia* are joints of the stem, differentiated truly to perform, in addition, the function of leaves, that is, purposes of assimilation and respiration,—but not the less true stem-elements, and therefore eminently capable of rooting at any point where a callus layer can be formed. It is this tenacity of life that has to be reckoned with. I could give you names of several farmers who have extirpated every *Opuntia* on their river-bounded property by sheer uprooting, and have rid themselves of the pest by simply throwing it, by waggon-loads, into the river when it happened to "come down." Of course, this simply passes the curse on to somebody unknown, living down-stream, and is scarcely to be held as a moral transaction.

Effective ways of Extirpation.—The only effective, cheap, and feasible method, to my knowledge, is to uproot and chop the *Opuntia* into short lengths, to pile the pieces in large rectangular heaps about 10 feet square and 5 feet to 6 feet high, carefully closing the lateral openings as much as possible and battening down the whole heap atop with plenty of large stones. Under these circumstances, the heap soon begins to heat, ferments, and the inner portion rots rapidly away. The outer layers exposed to change of air, resist longer, and when the centre has fallen in, are re-piled on the decayed mass and battened with stones as before. This heroic proceeding is, however, powerless to destroy the seeds, which are singularly horny in texture. I have seen a multitude of little plants, not a span high, rising from almost every square inch of the site of one of these piles, whence the stones had been removed to repair a kraal, and the wind had dispersed the fibrous residue of the rotted parent plants. This was the increase from the seed in the ripe prickly pears on the plants when first stacked up a year before. It was not without some difficulty that the proprietor was brought to see the probable future of these little villains, and at my earnest solicitation brought up two loads of dry kraal-dung to cover them completely, and enacted such an *Auto-da-fé* over them, by the help of a fire-stick, as effectually prevented all possible mischief thereafter. The moral of this experience is to stack the Prickly Pear for rotting down at the season when it has no fruit in evidence.

The former occupier of the Prickly Pear centre at Cookhuis Drift, being a man of great energy and intelligence, tried to put into practice a plan said to be effective in California for extirpation of the plant. This consisted in feeding the stem-joints or leaves as they are properly called, into a sort of mill, something like a bark-mill, with revolving cylinders armed with interlocking spikes. The *Opuntia* is completely demoralised in the passage through the machine and pours out of the delivery spout in a thick green pulp useless for mischief, useful for the compost heap. The attempt I speak of was made with no more perfect appliance than a small root pulper such as is used for mangolds, but enough was accomplished to show that with a properly adapted machine and sufficient power, an unlimited quantity of *Opuntia* might be destroyed with great rapidity and converted into potential manure.

Value of Prickly Pear as Fodder for Sheep and Ostriches.—I am aware that the plant has been occasionally turned to account in seasons of drought when food and water were equally scarce. But it is essential that the spicules be removed, and this necessity renders the exploitation of *Opuntia* as a food both tedious and costly. There is scarcely another way of utilising it except by very carefully singeing every section at a blazing fire. Certainly every spicule may be thus removed, but as each joint has to be separately picked up, exposed to the flame and turned over, just as in toasting bread, the plan seems amateurish and unpractical. Possibly two brush cylinders running at different speeds might clean off the spicules as aptly as the fire, but the invention has yet to be brought out. Nevertheless I know of a small and very valuable clump of thoroughbred stock in the Karoo saved in a hard season solely by the use of the *Opuntia*, rendered harmless by being well blazed with torches of Kersse-bosch [*Sarcocaulon Patersoni*, D.C.]. After passing through the fire, the sections were thrown into a turnip cutter set to cut very coarse. A little salt sprinkled over the mass made a sapid mess for which the imported ram and his progeny fought like dogs over a bone. I do not think one bit the more for this incident, however, that the plan is practicable on any scale but that of an experiment or a famine-dodge.

What you can do with ordinary appliances for a little lot of, say, twenty head of special stock, is as much out of your reach as a horn of the new moon when you have to find food for, say, fifteen hundred. Still I am far from saying the pestilent *Opuntia* may not be made, by some clever person, to pay for its footing and something more.

In the height of the mania for ostrich raising, which a few years ago supplied the place now taken by gold shares, the *Opuntia* was turned to account for feeding when green food was scarce, and the comparatively small number and greater value per head of the birds as compared with the sheep, made the exploitation of the plant more practicable.

After the usual singeing, the "leaves" were laid singly on a rude revolving table one foot square. On this worked a mechanical arrangement of four blades. A blow of the cutter slashed the leaf into narrow slips, and a half turn of the table presented the material for a second cut at right angles to the former one. Thus the stuff was very rapidly cut up into inch discs, and as rapidly put out of sight by the omniverous struisvogel [ostrich]. I believe I am correct in saying that these novel greens were not found to answer as more than an occasional dietetic change, but produced diarrhœa and other mischief when too freely used. Cooking by a process of steaming is worth a trial.

The Thornless Opuntia.—And here permit me to speak of the thornless or nearly thornless variety of *Opuntia*, known to Colonists as the ***Kaal-blad.*** This, I suppose, is the cochineal-cactus of Mexico, chosen for its especial value in the cochineal industry, and for the fewness, minuteness, and caducous character of the spicules. Old leaves may be safely handled ; young ones are easily made harmless by simple thrashing with a bundle of besom-riet [rushes, or what at the Cape supplies their place for besoms]. All that the common *Opuntia* may be made by careful manipulation the kaall-blad is, *proprio marte.* That the kaal-blad has not been spread purposely over the length and breadth of the land in otherwise useless wastes is just one of the many things that make one wonder and pity poor Africa. As I have said elsewhere, in a Garden Report, I think, " if by touch of a magician's wand the vast thickets of " Prickly Pear along the Klyn Visch, Melk and Blyde Rivers could be " turned into kaal-blad, there would be small chance of hearing of stock " slowly perishing of combined hunger and thirst." It would be a stand-by till better times, and would be food and drink at the same time, so succulent it is. I have not much of it as a specimen in my garden, but each year since 1883 I sent every bit of it that could be spared to the enterprising Luderitz at Angra Pequina, where it grew excellently. The very last communication from Herr Luderitz, scarce six months before his untimely decease, informed me that a hungry span of oxen, foodless and thirsty, had broken into the enclosure where the cuttings were being grown, and had eaten them up to the last square inch.

My argument, therefore, is very much to this end. If in this Colony and in Australia the thorny *Opuntia* has increased so much as to demand in some places legislative interference and Government expenditure for its extirpation, what store of food material, good enough for an occasional hard time, might not be encouraged to propagate itself in precisely similar localities if the comparatively innocuous and easily manipulated kaal-blad were only known and propagated of all men. And further, since Providence seems determined to spoil South Africa by indulgence what might not be done if mankind had the wit to propagate the infinitely more valuable *Spek-boom* [*Portulacaria afra, Jacq.*] all over the stony randts [ridges] and kopjes [hills] which are its natural habitat, an exceptionally good food, greedily devoured by horned stock and horses, occurring here and there in the greatest abundance, yet never artificially propagated. I can only fall back on my oft-used organ of wonder, and hope that in future years some Africander will arise to make ten spek-booms grow for every one alive to-day.

P. MacOwan.

As supplementing the information contained in Professor MacOwan's Memorandum, it may be mentioned that the plants popularly known as Prickly Pears present unusual difficulty in their determination owing to the confusion which exists as regards their literature. It is very desirable that a careful study be made of these plants as now existing in different countries, and that, if necessary, a complete set of specimens be prepared and forwarded to Kew for ultimate determination. It might be mentioned that the best method for packing the specimens of the typical stems would be in dry sand, while the prepared and dried flowers and fruits should be accompanied by careful drawings and descriptions.

SPECIES OF OPUNTIA.

Originally natives of the American Continent, inhabiting hot and dry places, the Prickly Pears were doubtless first introduced to the Atlantic islands, such as the Canaries and Madeira, and from these centres they have rapidly spread to the Mediterranean region in one direction and to St Helena, the Cape, and India in another direction. Owing to the facility with which they are propagated by portions of the stem and by seeds they are now established to a greater or less extent in most of the dry regions of both the Old and the New World.

The species more commonly met with in the Old World are *Opuntia Tuna*, L., *O. vulgaris*, Mill., *O. Dillenii*, Haw., *O. nigricans*, Haw., *O. monacantha*, Haw., *O. decumana*, Haw., *O. Ficus-indica*, Mill., and *Opuntia* (*Nopalea*) *coccinellifera*, Mill.

Opuntia Tuna, L., is well described by Lowe in the Flora of Madeira. Vol. I., p. 313. This is a tall plant, more or less spiny, with obovate-oblong or oblong-spathulate joints, two or three times as long as broad. The colour is dull green, with a glaucous tint. The spines are white, varying from one to two and five in a fascicle, and rarely an inch long.

The flowers are diurnal, scentless, and about two inches in diameter and of "a dull tawny reddish-orange or flame colour." The fruit is barrel-shaped, truncate, and widely umbilicate at the top, two or three inches long, and one and a half to two inches in diameter. The colour of the ripe fruit is pale green, with a pale greenish-white pulp. Lowe, an accurate and careful observer, states that this species is the only one employed in the Canaries for raising cochineal. It had existed universally in all the islands long previous to the introduction of the insect. It is recorded by Webb that the first introduction of the insect was violently opposed by the country people on the ground of its rendering the *Tuneras* or Prickly Pear plants barren and injuring the crops of their favourite fruit called Figos, which are even now much used, both fresh and dried.

Opuntia vulgaris, Haw. [Bot. Mag., tab. 2,393] has a low, diffuse stem, generally free from spines; the flower is yellow and the fruit purple.

Opuntia Dillenii, Haw. [*Cactus Dillenii*, Ker in Bot. Reg. IV., t. 255]. A very spiny plant, with a sulphur-yellow flower, slightly streaked on the outside with red, and a purplish pear-shaped fruit, is generally supposed to be the common prickly pear of India. The very slender spines of this plant are used generally in the Canaries for affixing the rags impregnated with the young insect brood to the plants of the true *O. Tuna*, L. Lowe states that the fruit of *O. Dillenii* is scarcely eaten. This species approaches nearest to *O. nigricans*, Haw. [Bot. Mag., tab. 1,557], which, however, has dark brown or black spines. Again the flowers of this latter are of a yellowish colour tinged with red, while the fruit is wholly red.

Opuntia (*Nopalea*) *coccinellifera*, Mill., belongs to an entirely different section of the genus, and is by some writers removed entirely from *Opuntia* and placed under *Nopalea*. The stem is grass green, with obovate oblong stem pieces. The *areolæ* are very distant and at length without spines. The *areolæ* at the summit of a young specimen bear single, recurved, small spines. The flowers are *crimson*, with the stamens exerted and closely surrounded by the bract-like petals.

PRICKLY PEAR IN INDIA.

From specimens sent to Kew in 1886 by Mr. Joseph Steavenson, the indefatigable Honorary Secretary of the Agri-Horticultural Society of Madras, it appears that there are three species of *Opuntia*, more or less, common in the neighbourhood of Madras. These are *O. nigricans*, Haw.; *O. Dillenii*, Haw.; and *O. monacantha*, Haw. The latter, according to Professor Oliver (who disagrees with the synonyms in Flora Brit. India), being the Cactus indicus of Roxburgh.

Owing to the immense tracts of country covered with Prickly Pear plants in India and elsewhere, various attempts have been made either to eradicate them as recommended by Professor MacOwan, or to utilise them in various ways for industrial purposes. In the way of eradication it was suggested some time ago to the Government of Madras to utilise the Prickly Pear plants in that presidency in the first place as a shelter for tree seeds sown broadcast amongst masses of them. It was hoped to secure the prickly pears as nurses for the tree seedlings, protecting them from the sun and from browsing animals, while the trees when grown up and forming a continuous canopy above would shade the Prickly Pear plants to such an extent as ultimately to destroy them.

In a Report published by the Government of Madras (dated 19 June 1883, No. 1,777) it is stated, as the result of experiments carried on in Trichinopoly, that some margosa (*Melia Azadirachta*) and tamarind seed sown broadcast in patches of Prickly Pear, resulted in the growth of 364 tamarind and 1,886 margosa seedlings. In South Arcot the plan appears to have been in use since 1874. The Deputy Conservator says "there can be no doubt of the results of the system." He refers to an instance where he had established within his district 6,257 seedlings above one foot in girth, and 31,422 less than one foot in girth, all grown on land previously occupied exclusively by Prickly Pears. He further states that the increased shade and moisture from the growing trees had been found ultimately to destroy the Prickly Pear plants.

In other districts in Madras the results obtained have not been so favourable. Where tree seeds of a suitable character are plentiful, and broad-cast sowings are made just before the rainy season, it is possible that the plan would prove effective. It is by no means an economical mode of treatment, and in most countries than India it could not be effectively carried out. Again in dry rainless districts in some parts of South Africa such as those described by Professor MacOwan, the plan would entirely fail.

COCHINEAL INDUSTRY.

As the cochineal insect feeds on species of Opuntia and a large industry is maintained in Mexico and in the Canary Islands to produce the cochineal of commerce, it has naturally suggested itself to introduce the cochineal insects to other countries where plants are abundant.

According to Lowe, as already noted, the only plant used in the Canaries for rearing the cochineal insect (*Coccus Cacti*) is *Opuntia Tuna*, L.

There is little doubt this is the principal cochineal plant, but there is equally little doubt that other species of Opuntia are also used. As the specific name implies *Opuntia* (*Nopalea*) *coccinellifera* is a recognised cochineal plant, and where abundant is preferred to any other on account of the absence of spines. Mueller (*Extra-Tropical Plants*) quotes *O. Hernandezii*, *O. Dillenii*, and *O. missouriensis*, as also serving for the rearing of the cochineal insect. With regard to *O. missouriensis* it is stated that Meehan found plants in North America covered with the cochineal coccus, and verified the fact that the latter could live through the intense cold which characterises the Rocky Mountains of the Colorado regions.

It appears that cochineal culture has been attempted to be introduced to India on several occasions. As lately as 1883 steps were taken by the Government of Madras to obtain broods of insects through the intervention of Sir Lambert Playfair, Consul-General for Algiers. These were shipped from Algiers to Madras to be placed under the care of the Superintendent of the Central Gaol, Coimbatore. On this point it is well to remember that according to Lowe very zealous and careful attempts have been made to establish a cochineal industry at Madeira in the immediate neighbourhood of the Canaries, but even there it has not become permanent. The failure is attributed to the difficulty of preserving or obtaining fresh seed (young insects) to re-stock the plants annually. Any experiments carried on in this direction should be undertaken in a comprehensive manner, and it is evident that a fresh supply of insects would be required annually until successive broods are established on a large scale.

GRAFTING PRICKLY PEARS.

Dr. Bonavia, of the Indian Medical Service, submitted, for the consideration of the Madras Government, in a letter dated 22nd October 1884, the desirability of introducing from Malta and Italy to India, plants of the best fruit-bearing species of *Opuntia* for the purpose of grafting them on the wild plants found in and around Madras. It is well known that many members of the natural order *Cacteæ* are remarkable for the ease with which they can be grafted on one another. Dr. Bonavia's suggestion was therefore well within the scope of practical effort. Plants obtained from Malta have been supplied by Kew to the Governments of St. Helena and Jamaica with the view of testing the feasibility of grafting Prickly Pears, and so improving the yield of fruit in those islands.

The principal species cultivated in the Mediterranean region for the sake of the fruit are *O. Ficus-indica* and *O. Tuna*. During the season the fruit is consumed in immense quantities, and forms, either fresh or dried, the principal article of food in certain districts. In the *Bulletin de la Société Nationale d'Acclimatation de France*, 4^e, vol. v., p. 643, after referring to the wide distribution of *O. Ficus-indica*, which produces *la Figue de Barbarie*, it is stated: "Une autre espèce "également cultivée dans la région méditerranéenne est l'*Opuntia* "*Tuna*, L., ses fruits sont, dit-on, plus volumineux et supérieurs en "qualité à la Figue de Barbarie ordinaire." Large quantities of the Prickly Pear fruit reach this country during the summer months, and they are obtained chiefly from the south of Spain and Malta.*

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* On Edible Cacti, see Gard. Chron., Vol. XXII. n.s., p. 171 (1884).

ALCOHOL FROM PRICKLY PEARS.

In a letter to the Foreign Office from Malaga, communicated to this establishment, dated 9th July 1886, Mr. Consul Bidwell draws attention to a Paper read before the Society of Natural and Physical Sciences at Malaga, by Don Fernando de la Cámara, on the cultivation of the Prickly Pear, locally called *Chambos*, and 'the employment of the fruit for the manufacture of alcohol.*

"The Author states that his experiments, which have extended over a period of twelve years, afford most satisfactory results, and he suggests that the cultivation of this plant advantageously takes place in this district, on land hitherto used for vineyards, which may have been destroyed by Phylloxera, or on land which could not otherwise be possibly cultivated."

"The subject matter of the Paper is divided under three headings:—(1) the cultivation of the plants; (2) the process of fermentation; (3) the establishment and cost of the machinery and utensils necessary for the manufacture of the spirit, all of which are minutely treated."

* * * *

"The practical results obtained by the Author in various districts of this Province, from which it appears that a row of plants of 10 metres in length, and two metres in width, produces at maturity, at Malaga, according to the situation, etc., from 2,000 to 4,500 pears or figs annually, or, say, affords an average crop of 2,600 figs per 10 metres."

"These results were obtained in rocky, uncultivated ground, while much better crops are apparently obtainable under careful cultivation."

"The weight of the figs is stated to be about 13 to the kilogramme. From the experiments made for extracting the juice of the fruit it would appear that in a solution of 40 to 45 per cent. the odour and peculiar characteristics are perceptible, but a liquor is obtained, which, it is thought, might be available for drinking purposes as aniseed brandy. During rectification these properties tend to disappear, and in solution of 70 to 75 per cent. the odour is much less apparent, while very little remains at 84 per cent. The average quantity of alcohol obtainable from the liquid is alleged to be eight per cent."

"Minute calculations are contained in the Paper, as well as regards the cost of cultivation as of the expenses of manufacture, which the Author states are the result of long and careful experiments on the subject."

The idea of utilising the Prickly Pear fruit as a source of alcohol is by no means a new one. Sugar has been prepared from the fruit in some countries, and it is well known that alcohol is the direct result of the fermentation of fruit-sugar. The utilisation of the Prickly Pear fruit purely and simply as a source of alcohol is a subject we have no desire to see entertained in our tropical colonies. It is to the credit of mankind that it has not sought indiscriminately for the mere agent of producing the physiological effects of alcoholic stimulation. The immemorial estimation of the fermented juice of the grape would be attributed by no one to the mere alcohol which underlies every variety of wine. We therefore deprecate the idea of preparing alcohol from Prickly Pear for human consumption.

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* Memoria sobre el Cultivo de los Chumbos y su empleo para la Fabricacion del Alchohol, leida en la Sociedad de Ciencias Físicas y Naturales de Málaga por el Socio Don Fernando de la Cámara. Málaga: Imprenta y Libreria de Don Ambrosio Rubio, 1886.

In countries where the fruit is produced in immense quantities advantage might be taken of the circumstance for the purpose of producing alcohol for purely industrial purposes. For instance, for extracting the perfume of flowers by what is known as the Myrogene process alcohol is an essential element. In most colonies alcohol suitable for such a purpose is obtained with great difficulty, and at prices which is practically prohibitive.

If alcohol from Prickly Pear is capable of being rectified so as to be suitable for perfumery purposes a very extensive field of usefulness is open to it. It might also be utilised for preserving fresh fruit for export purposes, and indeed there are endless ways in which it might be rendered capable of assisting the growth of local industries.

SILO EXPERIMENTS.

In Southern India the stems of Prickly Pear plants (presumably denuded of their spines and bristles) have been successfully preserved in silos. A fluid which copiously exuded from the stems under these circumstances was analysed by the Government Quinologist at Ootacamund. It was found to consist of gum, albuminous substances, and sugar, with traces of tannin and starch. It was considered by Mr. Hooper that mixed with grass this product of incipient fermentation of the Prickly Pear stems would have no injurious effect on cattle, but on the contrary, would prove to be a valuable addition to their regular supplies of fodder.

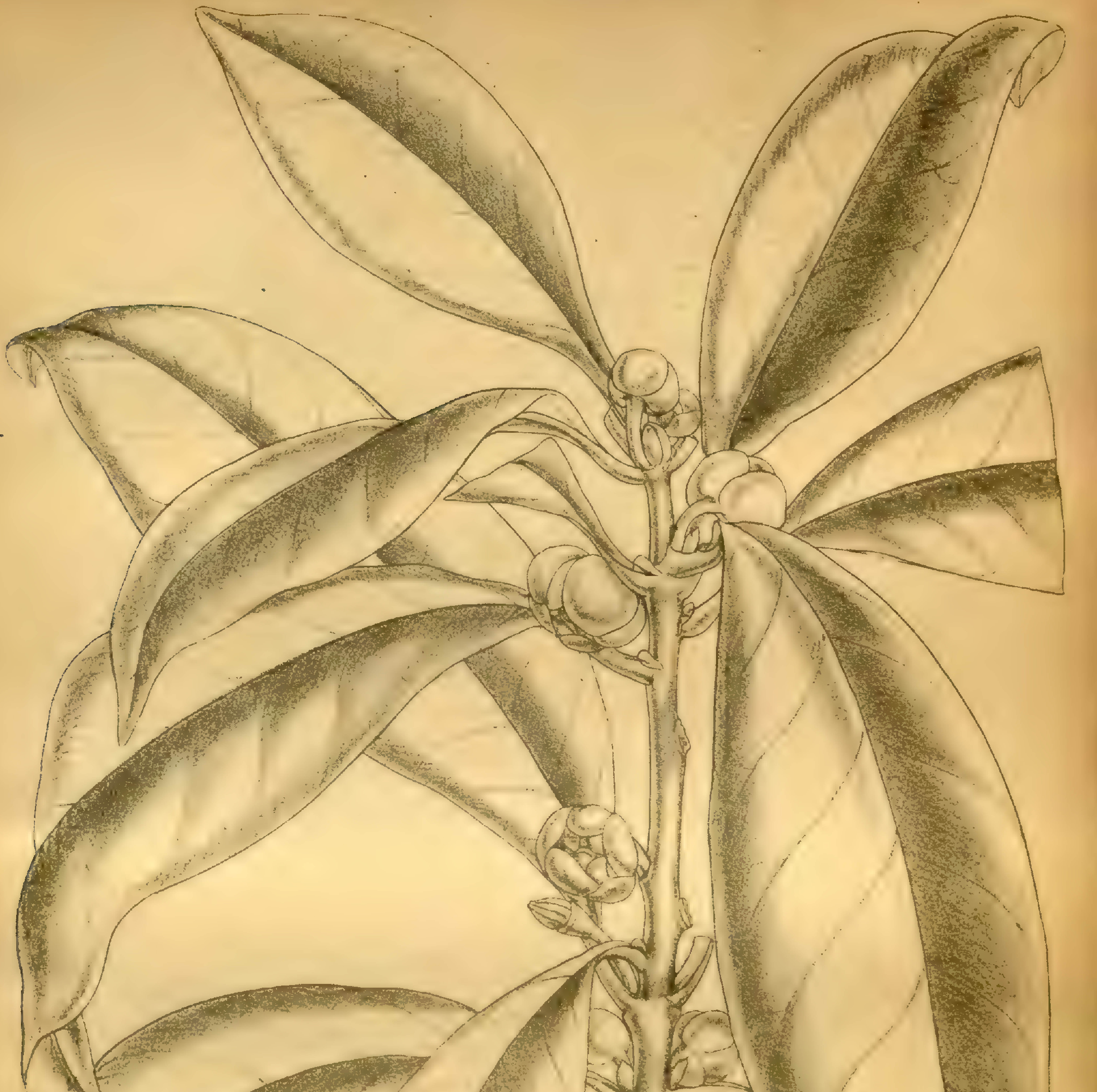
LV.—STAR ANISE.

(*Illicium verum*, Hook. f.)

The following interesting account of the true Star Anise of China has been prepared by Sir Joseph Dalton Hooker, late Director of the Royal Gardens, for the current issue of the Botanical Magazine [July 1888]. By the courtesy of the publishers, Messrs. Lovell Reeve and Co., we are enabled to give a reproduction of the drawing of the plant from a specimen growing at Kew, to which has been now added a drawing of the mature fruit :—

"The plant producing the true Star Anise of China is here for the first time figured and described. For many years the fruit so called was supposed to be that of *Illicium anisatum*, Linn. (*see* Bentl. and Trimen, Med. Pl., vol. i. t. 10), the Skimmi of Japan, or of *I. religiosum*, Sieb. and Zucc. (Tab. nost. 3965), supposed to be a native of China, but which is identical with *I. anisatum* of Linnæus and Loureiro. For an account of this plant, its history and characters, I must refer to Baillon's learned treatise, published in 1867, in his Adansonia (vol. viii., p. 1), and to papers by the late Dr. Hance and Dr. Bretschneider in the China Review (vol. ix. p. 283, &c.). It suffices here to observe that *I. anisatum* or *religiosum* are species with peduncles bracteate at the base, and long spreading inner perianth-segments, and that they hence belong to a different section of the genus from *I. verum*."

"The first person to recognise the fact that neither *I. anisatum* of Linnæus or of Loureiro could be the true Star Anise of China was Dr. Bretschneider, then Medical Officer to the Russian Embassy at Pekin, who drew attention to the fact that the Japanese plant was a reputed



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Illicium verum Hk. f.

though commonly compared with aniseed, the taste is really more like that of fennel; so that the name given to it by Redi (Experimenta, p. 172) in 1675 was *Fœniculum sinense.* In China the Star Anise is employed as a condiment and as a spice, and it is still used to flavour spirits in Germany, France (where it is the flavouring materia of Anisette de Bordeaux) and Italy. In England, according to Hanbury, it is used only as a substitute for oil of anise."

"The propriety of giving the new name of *verum* to this interesting plant may be challenged on the ground that the Linnæan one of *anisatum* should be retained for it, and another be adopted for the Japanese plant so long supposed to be the origin of the Star Anise. The objections to this course are twofold: the first is, that Linnæus (Sp. Plant. Ed. 3, p. 664) clearly describes this as his *I. anisatum,* the Skimmi of Kæmpfer, and cites Kæmpfer's Amœnitates for the same. He, however, adds, "Planta a me non visa, fide Kæmpferi recepta, *forte Anisum* " *stellatum officinarum,* quod adjectum Tetraodonti ocellari ejus auget " venenum." The italics are my own. The passage shows that Linnæus is not answerable for the reference of the Star Anise to *I. anisatum.* The second objection is, that it would require the adoption of another name for the old and well-known Japanese plant, for which, however, the synonym *I. religiosum* of Siebold and Zuccarini might be adopted.—*J. D. Hooker.*"

Explanation of Plate.

Fig. 1, Flower. Fig. 2, front view of stamen. Fig. 3, back view of stamen. Fig. 4, the carpels. Fig. 5, side view of single carpel :—all enlarged. Between Figs. 1 and 4 is represented the mature fruit.

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 20.] **AUGUST.** **[1888.**

LVI.—COLONIAL FRUIT—(continued).

In the *Kew Bulletin* for the months of November 1887 and January 1888 information, derived from official sources, was supplied, respecting the capabilities of certain Colonies for the production of fruits. The *Bulletin* for November 1887 was wholly devoted to a comprehensive report on the fruits of Canada. The *Bulletin* for January 1888 was devoted to reports furnished by their respective Governments on the fruits of Victoria, South Australia, Western Australia, Tasmania, New Zealand, Cape Colony, and Mauritius. In the present *Bulletin* it is proposed to continue the publication of such reports, and we now present a summary of information relating to the fruit productions and fruit resources of the West Indian Colonies:—Jamaica, Bahamas Islands, Barbados, St. Lucia, St Vincent, Grenada, Tobago, Trinidad, and British Guiana.

The list of questions to which answers are now furnished was published in the *Bulletin* for November 1887, pp. 2–4. This list, if

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1888.
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consulted, will afford a key to the arrangement of the reports and furnish those interested with the special points to which the inquiry has been directed.

JAMAICA.

The chief fruit interest in the West Indies is connected with Jamaica, The exports of fruits from this island are of the annual value of a quarter of a million sterling. The following Report was prepared by Mr. J. H. Hart before his transfer to the charge of the Botanical Gardens at Trinidad:—

The Chief fruits of the island of Jamaica are Cocoa-nut (*Cocos nucifera*), Banana (*Musa sapientum*), Orange (*Citrus Aurantium*), Pineapple (*Ananas sativa*), Lime (*Citrus Medica*, var. *acida*), French Lime (*Citrus Medica*, var. *Limetta*), Mango (*Mangifera indica*), Citron (*Citrus Medica*), Lemon (*Citrus Medica*, var. *Limonum*), Shaddock (*Citrus decumana*), Forbidden Fruit (*Citrus decumana*, var.) Avocada Pear (*Persea gratissima*), Bread Fruit (*Artocarpus incisa*), Neesberry (*Achras Sapota*), Bilberry (*Vaccinium meridionale*), Strawberry (*Fragaria vesca*), Star Apple (*Chrysophyllum Cainito*), Guava (*Psidium Guava*), Pomme d'or (*Passiflora laurifolia*), Granadilla (*Passiflora macrocarpa*), Nutmeg (*Myristica fragrams*), Otaheite Apple (*Eugenia malaccensis*), Rose Apple (*Eugenia Jambos*), Otaheite Gooseberry (*Cicca disticha*), Cashew (*Anacardium occidentale*), Grapes (*Vitis vinifera*), Cherimoyer (*Anona Cherimolia*), Sour Sop (*Anona muricata*), Custard Apple (*Anona reticulata*), Sweet Sop (*Anona squamosa*), Genip (*Melicocca bijuga*), Tree Tomato (*Cyphomandra betacea*).

Cocoa-nut (*Cocus nucifera*).—This is placed first on the list on account of its being a fruit which is likely to become in the future of more permanent value than any other, (1) on account of its keeping qualities, (2) for its economic value, (3) for certainty of crop, (4) for permanence of crop, (5) by reason of its requiring little or no cultivation, and (6) by its being adapted to many kinds of soil.

Banana (*Musa sapientum*).—Obtainable throughout the year, but most plentiful during August and following months. Supply good, except after hurricanes; cultivation might be largely extended.

Orange (*Citrus Aurantuim*).—In full season during the closing months of the year. Supply very good, capable of being largely extended.

Pine-apple (*Ananas sativa*).—In season June, July, and August in large quantities; all the year round in fair numbers. Could be grown in large quantities if demand arose.

Lime (*Citrus Medica*, var. *acida*).—In season all the year round. If a paying demand arose the supply could in three or four years be made unlimited.

French Lime (*Citrus Medica*, var. *Limetta*).—This possesses more juice; is larger, with skin resembling an orange; it is a very fine fruit. The supply is small, but worthy of extensive cultivation.

Mango (*Mangifera indica*).—Throughout the island the supply is now practically unlimited, but were an export demand to arise better varieties would be planted and the value increased. In season June, August.

Citron (*Citrus Medica*).—Supply small all the year round. Capable of being extensively grown at lower elevations of excellent quality.

Lemon (*Citrus Medica*, var. *Limonum*).—Supply small, but of excellent quality; could be extensively grown.

Shaddock (*Citrus decumana*).—*See* Lemon.

Avocado Pear (*Persea gratissima*).—Supply very good. In season from June to September at different elevations. Supply could be very largely extended in a few years.

Bread Fruit (*Artocarpus incisa*).—Supply small comparatively, except in moist districts; in season during most months of the year. If cooked by baking will keep well for two or three weeks.

Neesberry (*Achras Sapota*).—One of the most delicately flavoured and wholesome fruits grown. Gathered when "full," it will stand transport well. In season June to November.

Bilberry (*Vaccinium meridionale*).—A wild mountain fruit which could be readily cultivated; makes a fine coloured natural jelly, a good wine, and is excellent for tarts. June and August.

Strawberry (*Fragaria vesca*).—A small variety resembling the Alpine species. In season on the mountains at 4,000 feet during nine months of the year, wild.

Star Apple (*Chrysophyllum Cainito*).—In season June to September. A fruit difficult to transport.

Guava (*Psidium Guava*).—Supply limited. Wild; no good varieties cultivated though present. June and July.

Pome d'or (*Passiflora laurifolia*) and Granadilla (*P. macrocarpa*).—Could be cultivated in quantities for export. July, September.

Nutmeg (*Myristica fragrans*).—Mentioned here for sake of its pericarp or outer fleshy envelope which is succulent and possesses a fine mild spicy flavour; makes an excellent and rare preserve, which only waits to become known to encourage a large demand.

Otaheite Apple (*Eugenia malaccensis*) and Rose Apple (*Eugenia Jambos*).—Make excellent preserves, and are in season from June to October. They possess a flavour which reminds of the smell of rose, the latter especially.

Otaheite Gooseberry (*Cicca disticha*).—An acid fruit. Might be bottled as gooseberries.

Cashew (*Anacardium occidentale*).—Makes an excellent preserve; will not stand transport. Nuts, when roasted, are a choice dish for dessert.

Grapes (*Vitis vinifera*).—Grown in small quantities in the neighbourhood of Kingston, chiefly the Muscat varieties, but never likely to become a reliable crop, all the year round.

Cherimoyer (*Anona Cherimolia*).—A mountain fruit of great delicacy, but difficult to transport. July to September.

Sour Sop (*Anona muricata*), Custard Apple (*A. reticulata*), Sweet Sop (*A. squamosa*), and Genip (*Melicocca bijuga*).—Tropical fruits of ordinary value. June to October.

Tree Tomato (*Cyphomandra betacea*).—A tree bearing a fruit of excellent quality, which when preserved, somewhat resembles in colour and flavour the Apricot of Europe. Will only grow at elevation of 3,000 ft. and upwards in a temperature of 63° mean annual. The tree fruits all the year round; is easily cultivated, and the supply could be increased to any extent in two or three years.

Of the fruits most capable of being produced in larger quantities the first 14 mentioned are most deserving of notice, for they could be extended to an enormous degree if proper facilities were afforded for placing them in suitable markets. The production of the other fruits mentioned could be increased to a very large degree if any profitable demand were to arise.

The steps necessary to develop the fruit trade are:—

1. Suitable and speedy transport.
2. Certain markets.
3. The institution of a system of brands at port of export so that fruit of a certain brand should be of uniform quality; in a similar manner to the governmental inspection of fish stuffs in the province of Nova Scotia, which does not permit an inferior article to be exported.
4. A better system of packing, methods for which might be introduced under Government control for a time to show cultivators that higher prices would surely accrue from well-packed fruit.
5. To introduce a syndicate for packing, delivery, and sale of fruit produce in the best markets, instead of trusting to brokers and irresponsible agents.
6. Telegraphic communication from responsible agents to enable sellers to place their produce at ports where there is the best demand from time to time.
7. And not least, money at easy rates to assist cultivators or an agricultural loan bank.

As to preserved fruits, the local methods hitherto in vogue are too expensive. What is required is to institute the modern English and American methods, which should be done by someone conversant with the extensive plant required in a preserved fruit factory. The price of locally preserved fruits is prohibitory to their extensive sale, and as a rule the taste of buyers is not consulted. An article suitable for the West Indies does not as a rule suit the European palate.

The quality of Pine-apples, Bananas, Oranges, Lemons, Mangoes, and Neesberries grown in Jamaica is of such a high character, that if suitable transport were provided they would obtain a ready sale in almost any market in their fresh state.

BAHAMA ISLANDS.

The principal fruits of the Bahamas are Pine Apple, Sweet Orange, Banana, Grape Fruit,* Cocoa-nut, Plantain, Limes, Mango, Sapodilla, Tomato, Water-melon, Pumpkin, Alligator or Avocado Pear, Guava, Tamarind, Lemon, Sour or Seville Orange, Shaddock, Sour Sop, Sugar Apple, Ground or Pea-nut, Mammee, Cucumber, Rose Apple, Bread Fruit, Egg Plant, Cashew Nut.

The Pine Apple is obtainable from the latter part of May to end of July. Crop amounts to about 6,000,000 fruit. The wholesale local prices are 2*s.* per dozen for the first cuttings, or pick of the fields, 1*s.* 3*d.* to 1*s.* 6*d.* per dozen for the second cuttings, and 9*d.* to 1*s.* per dozen for the third cuttings.

The Sweet Orange, Grape Fruit, Lime, Lemon, Shaddock, and Sour Orange are in season from October to January. The Sweet Orange yield is fully 4,000,000. The wholesale local price is 1*l.* per thousand. The Grape Fruit Crop amounts to about 150,000. Wholesale local price 2*s.* per hundred. Of the Lime, Lemon, and Sour Orange no estimate can be given. Only a small quantity of each is available. At the present time they are grown chiefly for local consumption. The wholesale prices are respectively 9*d.* to 1*s.* per hundred, 15*s.* per thousand, and 10*s.* per thousand. The cultivation of the Shaddock having materially eclined within the past 15 years, the crop does not now amount to more than 4,000 to 5,000 fruit. The wholesale price is 4*s.* per hundred.

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* A variety of the Shaddock or the Pumelow.

The Banana, Plantain, and Cocoa-nut can be obtained throughout the year. The annual yield of the Banana must be fully 400,000 bunches, by far the greater part of which is locally consumed. The quantity available for export at any one time does not exceed more than 2,000 bunches, and these would have to be collected at different points. Wholesale price from 1*s.* to 2*s.* 6*d.* per bunch.

The Plantain is extensively grown, but being an important article of food, nearly the entire crop is consumed in the Colony. The annual yield is nearly equal to that of the Banana. The quantity available for export, however, is much less, and does not exceed at any one time more than 300 to 400 bunches. Wholesale price is from 1*s.* 6*d.* to 4*s.* per bunch.

The Cocoa-nut is also extensively consumed at home. The annual crop is about 1,000,000 nuts, of which from 8,000 to 10,000 can be obtained any month for export. Wholesale price 4*l.* per thousand. In a short period the crop of this fruit ought to be double that of the present time. A few years ago large numbers of trees were planted throughout the Colony, which will soon commence to bear.

The Tomato is obtainable from December to March. It is raised both for home consumption and for export. The quantity annually exported is about 2,000 bushels. Wholesale price averages 4*s.* per bushel.

The Mango is in season from June to August. No reliable estimate of the extent of the crop can be given. It is never less, however, than 1,000,000 fruit, nearly all of which are locally consumed. Owing to the rapid ripening and decay of this fruit after being plucked, it is almost impossible to export it with any prospect of success. It will not stand a sea-voyage of over a few days' duration. The foreign trade is therefore exceedingly small, and is almost entirely confined to the near port of Key West.

The above remarks also apply to the Avocado Pear, the Sapodilla, the Sour Sop, and the Sugar Apple.

The Avocado Pear is obtained in August, September, and October. Wholesale prices 4*s.* to 6*s.* per hundred.

The Sapodilla, first crop, is in season in February and March, and the second crop in August and September. The tree grows without cultivation and in the greatest abundance. The annual yield is immense, being several millions, only a proportion of which is utilised. Wholesale price 9*d.* per hundred.

The Sugar Apple is not available for export, and the Sour Sop in a limited quantity only (not over 1,000). The wholesale price of the latter is about 15*s.* per hundred.

The Water Melon is obtainable in quantity for export from May to September. The crop is about 10,000 only, about one-third of which is exported. Wholesale price averages 1*l.* 5*s.* per hundred.

The Pumpkin can be obtained throughout the year, but principally during the summer and autumn months. Annual yield about the same as that of the Water Melon. Wholesale price also about the same.

The Guava is in season from August to October. Crop large, and is almost entirely used in the manufacture of preserves. There is no foreign trade in the raw fruit. Wholesale price about 2*s.* per bushel.

In the other fruits enumerated, there is so little trade at present that they are unworthy of special reference in the replies to query 2. They are included in the list of important fruits only to show that they can be and are cultivated in the Colony, and that they only require the opening-up of markets for their profitable sale to make them become important articles of export.

BAHAMAS FRUITS exported in a FRESH STATE in 1886.

Name.	Destination.	Quantity.	Value.
			£
Pine Apples	United States	388,800 doz.	34,185
Do.	United Kingdom	18,865 „	2,810
Sweet Oranges	United States	3,198,196	4,031
Bananas	„ „	10,930 bunches	434
Grape Fruit	„ „	67,696	80
Do.	United Kingdom	34,760	60
Cocoa-nuts	United States	30,533	115
Plantains	„ „	76 bunches	4
Limes	„ „	133,600	62
Mangoes	„ „	64,000	41
Sapodillas	„ „	131,600	37
Tomatoes	„ „	8,329 crates	34
Water Melons	„ „	3,544	34
Pumpkins	„ „	4,935	33
Avocado Pears	„ „	7,900	10
Tamarinds	„ „	4 bbls.	1
Lemons	„ „	4,850	3
Sour or Seville Oranges	„ „	2,700	1
Shaddocks	„ „	218	3
Sour sops	„ „	800	6
Mammees	„ „	120	1

BAHAMAS FRUITS exported in a PRESERVED STATE in 1886.

Name.	Destination.	Quantity.	Value.
			£
Pine Apples	United States	23,686 cases	5,534
Do.	United Kingdom	50 „	10
Pine-Apple Juice	United States	31 bbls. „	2
Guavas	„ „	113 cases	35
Do.	United Kingdom	75 „	30
Sapodillas	United States	92 „	37
Tamarinds	„ „	99 „	25

With the exception of the Pine Apple, all of the fruits mentioned are capable of being produced in much larger quantities than at present. The Pine Apple will not grow throughout the Colony. It requires special soils and favourable localities, which are found on only a few of the islands. The bulk of the crop is raised on the Islands of Abaco, Eleuthera, and Cat Island. The land adapted to its cultivation is now nearly all utilised. It is not at all probable, therefore, that the production of this fruit can be increased.

Owing to the contiguity of the Bahama Islands to the United States of America, that country almost monopolises the trade in both fresh and preserved fruits. The mother country is too far away to admit of any important and profitable fruit trade being developed with it. The only fresh fruits which can be exported to the latter with any prospect of success are the Pine Apple, the Grape Fruit, and the Shaddock, and these only in limited quantities. No others will stand the long sea-voyage between the islands of the Colony and the port of London. To the markets of the United States, therefore, these islands have principally to look for any further development of their fruit trade.

The steps necessary to be taken to secure this object are:—

(1.) The establishment of telegraphic communication. Beside Florida and Southern California, these islands have to compete with Cuba, Jamaica, Porto Rico, and other West Indian Islands, all of which have cable connexion with the United States. So far as position is concerned, the Colony possesses a decided advantage over its West Indian competitors in the fact that it is nearer to the market of demand. This advantage, however, is entirely lost by the fact that it does not possess the facilities which its competitors enjoy, the most important of which is cable connexion. In the fruit trade especially it is highly important that a market of supply be in telegraphic communication with its markets of demand. The extent of supply, the extent of demand, and the ruling prices should be matters of daily information to the shippers from the Colony, while on the other hand the consignees at the ports of delivery should also be posted as to the nature and extent of the cargoes which are being sent to them for sale. Fruit being a highly perishable article, has to be rapidly handled and sold after reaching its destination. Before its arrival all arrangements for its sale should be made. This course is adopted in the case of shipments from Cuba, Jamaica, and Porto Rico. The necessary information is conveyed from the shipper to the consignee by cable. Unfortunately this course cannot be taken in the Bahamas, and the dealers in the Colony are handicapped, and labour under a great disadvantage.

(2.) Increased steam facilities for shipping the fruit.

During the summer and autumn, when the principal fruits are in season, a steamer of one line makes a trip once in every four weeks with the port of New York. This is the only regular and reliable steam connexion. There is no competition. The results are, that only a small proportion of the fruit crops can be shipped by steamer, the bulk being necessarily forwarded by sailing vessels; and secondly, excessive freights on all shipments made by the steamer. In the matter of steam facilities the Colony also labours under great disadvantages as compared with those possessed by the West Indian Islands before mentioned.

(3.) The removal of the high protective duties on Oranges and other raw fruits, and on preserved fruits, in the United States.

The imposition of these duties is, first, for the protection of the orange growers of Florida and Southern California; and second, for the protection of the "packers" of preserved Pine Apples in the United States. Oranges being extensively cultivated in the States alluded to, are heavily taxed. Pine Apples not being raised to any great extent, are admitted duty free in the raw state, but are heavily taxed when preserved. Pine Apples were only placed on the free list by the United States Government a few years ago, and only after the establishment of preserving factories in these islands. The effect of this policy is to afford double protection to the American packer. The remission of the duty has enabled him to buy the raw fruit at a much lower rate than heretofore, and he has also to help him the high protective duty imposed on the preserved fruits imported into the United State from this Colony. The placing of Pine Apples on the free list by the United States Government without its making any reductions in the duties on preserved fruits has crippled the preserving industries of the Colony. Some of the factories have suspended operations, and those in existence are not doing a very large trade. The remission of the duties referred to would therefore prove a great help to the fruit trade of these islands.

(4.) Increased demand.

The supply of tropical fruits imported into the United States from this and other places is fully, if not more than equal, to the present existing demand, particularly in the matter of Pine Apples and Oranges. For the past few years the cultivators of Pine Apples in these islands have been unable to dispose of the whole of their crops. Until the demand increases, it would be unwise to extend the cultivation of Pine Apples at least. Increased demand is a question of time, however, and only can be expected to keep pace with, or follow, increased population in the United States.

(5.) Improved methods of cultivation, so as to increase the yield and improve the quality of the fruit. It is a well-known fact that the fruits exported from this Colony do not rate with those from other places. The Pine Apples are surpassed by those from Cuba, Jamaica, and Porto Rico, and the Oranges by those from Florida. Within the past few years there has been a marked deterioration in the size and flavour of the Bahama Pine Apple, owing, it is supposed, to the fact that all of the best land has already been cultivated. There can be no doubt that the fruit can be improved by higher cultivation. Manures and fertilizers should be more generally and freely used. The fields and orchards should be kept clear of weeds. The Orange and other fruit trees should be regularly and carefully pruned and scraped. These important matters are generally neglected in the Bahamas, and the result is that the trees and plants are usually in a weak and sickly condition. They do not possess the necessary vitality to withstand long periods of drought, and easily become the prey of the scale and other insects. The exportation of all fertilizers from the Colony ought to be prohibited, for every ounce of them which nature has bestowed upon us is required and ought to be generally used for our own purposes.

(6.) The exercise of more care in the packing of the fruit and in its sorting and grading, the latter seldom attended to.

As regards suggestions for the improvement of the fruit industry in the Bahamas it might be mentioned that the cuttings from the Pine Apples prepared and preserved at the Pine Apple Factories could be utilized in the manufacture of Wine, Spirits, or Vinegar.

Oil of Orange and Oil of Lemon could be extracted from the skin of these fruits. Rose flavouring or extract could be obtained from the Rose Apple. Saccharine matter could be extracted from the Sapodilla. This fruit also yields a rich and delicately flavoured syrup. Valuable fibres can be obtained from the leaf or stalk of the Pine Apple plant, and also from the Banana and Plantain trees, also from the Cocoa-nut. Perfumery could be extracted from Orange and other blossoms. Guavas could be more largely utilized in the manufacture of jellies and other preserves.

BARBADOS.

The chief fruits grown in Barbados are Bananas, Oranges, Shaddocks, Tamarinds, Mangoes, Star Apples, Golden Apples, Avocado Pears, Guavas, Grapes, Cashews, Sapodillas, Pine Apples, Chili Plums, Pomegranates, Mammee Apples, and Papaws.

2. (*a.*) What little fruit there is is chiefly obtainable from September to March. (*b.*) The only fruit available for export are Tamarinds.

(*c.*) The wholesale price of Tamarinds varies from three shillings to five shillings per hundred pounds.

3. (*a.*) No fruit is exported in a fresh state. (*b.*) Tamarinds are exported preserved in treacle; the value of which for five years ending 31st December 1885 is as follows, viz.:—

	£	*s.*	*d.*
1881 - - - -	1,307	10	0
1882 - - - -	1,122	7	6
1883 - - - -	1,139	10	0
1885 - - - -	2,407	7	6

(*c.*) All of the above was shipped to Great Britain with the exception of small quantities sent to British North America in 1882, 1884, and 1885, the value of which amounted in the aggregate to one hundred and forty-three pounds ten shillings.

4. All the fruits mentioned above are capable of being produced in much larger quantities than at present, but land is considered to be by most landowners far too valuable for such a purpose as growing fruit.

5. (*a.*) The following fruits are imported in a fresh state, chiefly from the United States of America, viz.: Apples, Pears, and Peaches; (*b.*) In a preserved state: Apples, Pears, Peaches, Plums, Apricots, Greengages, Raspberries, Gooseberries, Damsons, Currants, and Cherries. (*c.*) There is no way at present by which the quantity and value can be ascertained.

6. As there is no prospect of Barbados ever becoming a fruit-producing country to any extent there is hardly need for further remarks.

ST LUCIA.

We are indebted to Mr. R. P. Cropper, Secretary of the Agricultural Society, for the following report on the fruit industry of St. Lucia:—

Hitherto sugar has occupied everybody's attention. But while a new departure is manifesty and urgently necessary, nobody has hit upon what ought to be done. The call for tropical fruits for the British market comes opportunely, and I should suggest that one or two enterprising persons or firms, local or English, should make trial shipments to England on a moderate scale. Failure can scarcely be anticipated, especially in the matter of preserves, and demand might fairly be expected to increase. As soon as it is found that it is profitable to export preserves and fruit on a large scale, people will wake up to the advantages of the new industry, and fruit cultivation and preserve making will be greatly extended. I add, in reply to question put, that all our fruits are capable of being produced in much larger quantities than at present, but the growers of fruit and makers of preserves have not the means of making shipments at their own risk. A few planters in better circumstances show a disposition to engage in the cultivation of spices and fruits, but the stimulant of actual, not speculative, demand is absent. When positive orders are given, the response will be certain and large.

From St. Lucia, apart from the staples:—sugar, rum, and cacao, comparatively little fruit is exported. Mangoes are exceedingly abundant, and hundreds of barrels, perhaps I may safely say thousands of barrels, are shipped in the season to Barbados. A fairly large exportation goes on in Bananas, Oranges, and Pine Apples to the same place. Other fruits are shipped in very small quantities. A short time ago Bananas were in considerable demand for St. Thomas, but the call has fallen off very much. Our other neighbours grow all the fruits that we do and supply their own wants. There is consequently no demand for our fruits, and no motive for growing more than we need for our own immediate consumption.

There can scarcely be said to be any export trade in preserves beyond boxes of succades for presents.

Practically there are no imports of fruits, except a few barrels of Apples in the fall of the year. But jams and jellies, candied fruit, Raisins, Figs, &c., from England and France, are pretty largely consumed.

The seasons for fruits vary considerably, and the months named in the accompanying tables are not constant year after year. I have observed that some fruits can be bought not only over a longer term of months in St. Lucia than in the neighbouring islands but even in different months in different years. The months named in the tables indicate, generally, when the fruits begin to be abundant. Smaller quantities are procurable before and afterwards.

The prices of preserves given are such as would be taken if large orders had to be executed; and would probably fall lower if competition should arise. At present what are set down at 8*d.* a lb. are actually sold at 1*s.*, and the 1*s.* 3*d.* articles at 1*s.* 6*d.*

I make no attempt to indicate the quantities by figures. I do not think any estimate would be even approximately correct.

LIST OF ST. LUCIA FRUITS.

Local Names.	Seasons.	Values.	Quantities.
Avocado Pear	June	4*s.* per 100	Moderate.
Banana (2nd)	All the year	1*s.* 3*d.* a bunch	Large.
Bread Nuts	July	5*s.* 100 lbs.	Small.
Cashew Nuts	May, &c.	8*s.* "	Large.
Cocoa-nuts	All the year	7*s.* 100	Moderate.
Custard Apple	February	4*s.* "	Small.
Grape Fruit	November	3*s.* 6*d.* 100	Moderate.
Ground Nuts	December	——	——
Limes	June, &c.	4*d.* 100	Large.
Mammee Sapote	May, July	2*s.* "	Moderate.
Mangoes (1st)	June	4*d.* to 7*d.* 100	Very large.
Orange (3rd)	November	1*s.* 100	Moderate.
Pine Apple (4th)	June	13*s.* "	Small.
Pomegranate	September	3*s.* "	Moderate.
Sapodillas	March	2*s.* 6*d.* 100	Small.
Shaddocks	December	12*s.* 100	"
Sour Sop	October	6*s.* "	"
Sugar Apple	June	2*s.* "	Large.
Tamarind	April	2*s.* 6*d.* 100 lbs.	"
Water Lemon	May	2*s.* 10	Moderate.

The order of importance of the exports is Mangoes, Bananas, Oranges, Pine Apples. Of the others the exportation is scarcely appreciable, even to Barbados and some cannot bear a long voyage except under the frozen-air treatment. Ground nuts have almost gone out of cultivation. St. Vincent supplies nearly all that we eat. The probable value of fruits sent to Barbados is from 300*l.* to 400*l.* a year.

List of St. Lucia Preserves.

Local Names.	Seasons.	Values.	Quantities.
Bread Fruit blossom	June	8*d.* per lb.	Small.
Cacao	March	1*s.* 3*d.* per lb.	”
Cashew Nuts	May, &c.	8*d.* ”	Large.
Cherry (1)	June	1*s.* 3*d.* ”	Small.
Citron	June	1*s.* 3*d.* ”	Large.
Cocoa-nuts	All the year	8*d.* ”	”
Figs	June	8*d.* ”	Small.
Ginger	March	1*s.* 3*d.* ”	”
Golden Apple	November to March	8*d.* ”	”
Gooseberry (2)	June	8*d.* ”	Large.
Granadilla	All the year	1*s.* 3*d.* ”	Small.
Guava	July	8*d.* ”	Large.
Limes	June	1*s.* 3*d.* ”	Small.
Mammee Sopote	May, &c.	8*d.* ”	Large.
Nutmeg (pulp)	August	1*s.* 3*d.* ”	Small.
Orange	November—March	8*d.* ”	Large.
Papaw	All the year	8*d.* ”	”
Pine Apple	June	8*d.* ”	”
Plumrose (white) (3)	June	8*d.* ”	Small.
Shaddock (Pith)	December	8*d.* ”	”
Sorrel (4)	December	8*d.* ”	”
Tamarind	January—June	1*s.* 3*d.* ”	Large.
Tomato	May, &c.	1*s.* 3*d.* ”	Small.

(1.) Malpighia punicifolia.
(2.) Cicca disticha.
(3.) Eugenia Jambos.
(4.) Hibiscus Sabdariffa.

St. Vincent.

Mr. Huggins has prepared the following report on the fruits of St. Vincent :—

The principal kinds of fruit produced in St. Vincent in order of quantities are the Banana, in several varieties, the Mango, many varieties, the Pine Apple, the Guava, the Orange, the Avocado Pear, the Mammee Sapote, Jamaica Plums (*Spondias purpurea*), Limes, the Java Plum (*Eugenia Jambolana*), the Golden Apple (*Spondias dulcis*), the Sugar Apple (*Anona squamosa*), the Sapodilla (*Achras Sapota*). There are several other sorts of less importance as the Malay Apple, Papaw, Granadilla, Bread Nut, and the Pomme Rose (*Eugenia Jambos*).

The Banana is ripe throughout the year, Mangoes from April to October, Pine Apples June to August, Guavas April to October, and November, Mammee Sapota May to July; the others are ripe at various times in the year. The quantities of fruit available for export from St. Vincent are very small; there is no regular cultivation of any sort, and it takes nearly all the present production to supply the local wants. The prices vary considerably and depend on the abundance or otherwise of the crops, but there is no true wholesale market, and (except in the case of Mangoes, which are bought in quantity from the growers at home), the fruit is all brought in from the country in small lots by the producers; Oranges are retailed when abundant at four fruits for one halfpenny; when purchased from the growers the price is about half of the above. Bananas are retailed at from three to seven fruits for 1*s.* 2*d.*, according to the kind or quantity. Mangoes are sold at about four to eight for one halfpenny, but prime fruits are very seldom put on the market. The pine apple is sold at from 2*d.* to 4*d.* each. The prices of these fruits are about half of the above when purchased from the growers.

There are no means of arriving at the value of the fresh fruit exported from this Colony, as no separate account is kept of them at the Custom House, no duty being paid upon them. But Mangoes, Bananas, and Avocado Pears are exported in small quantities to the neighbouring Colonies of Barbados and Trinidad. Other fruits are occasionally sent to these places, but in no appreciable quantities. A blight some years back seized upon and killed nearly all our Oranges and Cocoa-nuts, and it is only of late that Oranges have again sprung up. Dried fruits are not exported, and the value of confectionery is almost *nil.*

There is great room for the extension of the cultivation of all kinds of fruit grown here—the local wants extend as opportunity for gratification occurs, and export is in its infancy. The nearest possible market of any magnitude is that of the United States, but that is more readily supplied from Jamaica, and the other larger Colonies, who have already direct, rapid, and regular communication with New York and other ports.

Trinidad is already starting the cultivation of the Banana for the American market; and could our people be induced to see that money is in it, they would probably make the same attempt, but to do this we *must* have regular direct communication, and in the present condition of this essential to success I am afraid there is little chance of doing much more than at present in the fruit trade. If those who have the control of the fruit steamers running to Trinidad could be induced to make it known that should there be a prospect of a sufficient supply being obtainable they would include this island in their operations, I have no doubt that cultivators would be stimulated and a very large increase of fruit be grown, and in view of this it is recommended that the local government should take steps to ascertain the possibility of obtaining the requisite communication with the United States, America, and, if so, to utilize the scheme just started of peasantry proprietors, and wherever practicable to cause them to include the growth of the proper kinds of fruit amongst their productions, and more especially so on the leeward coast where carriage is easy by boat.

There are no fruits imported of any value in a fresh state. Owing to the blight which attacked and killed our Cocoa-nut trees, we are in a great measure dependent on the neighbouring Colonies for our supply of nuts, which are imported dry. A small quantity of dried and preserved fruit is procured from England, these are Raisins, Currants, Almonds, &c., but the total value is insignificant. There are no other remarks or observations regarding the fruits of this Colony other than apply generally to the fruit of all tropical lands.

GRENADA.

Information respecting the fruits of Grenada has been prepared by Mr. W. R. Elliott, Curator of the recently-established Botanic Gardens in that island.

The principal fruits grown at present at Granada are :—

GRENADA FRUITS.

Name of principal Fruits.	When in Season.	Local Prices.
Oranges	December to May	10*d.* to 1*s.* per 100.
Pine Apple	February to April	2*s.* to 6*s.* per dozen.
Mango	June to August	6*d.* to 1*s.* per 100.
Sapodilla	December to April	1*s.* per 100.
Banana	Whole year	6*d.* to 1*s.* per bunch.
Plantains	Whole year	6*d.* to 1*s.* per bunch.
Limes	October to December	3*d.* per 100.
Guava	October to December	3*d.* per 100.
Avocado Pear	July to September	1*s.* to 1*s.* 6*d.* per 100.

In the above table only such fruits as are suitable for export to home markets have been given. There are numerous other fruits more adapted for export to the neighbouring islands, the following being among the most important:—Bread Fruit (*Artocarpus incisa*), Sweet Sop (*Anona squamosa*), Sugar Apple (*Anona reticulata*), Cashew (*Anacardium occidentale*), Water Lemon (*Passiflora laurifolia*), Rose Apple (*Eugenia Jambos*), Granadilla (*Passiflora quadrangularis*), Star Apple (*Chrysophyllum Cainito*).

It is almost impossible to judge of the amount of fruit available for export. There are at present enormous quantities of fruits allowed to rot owing to there not being sufficient demand for them.

The whole of the fruits mentioned above, particularly Oranges, Pineapples, Mangoes, and Sapodillas, are capable of being produced in much larger quantities than at present. To develop a fruit trade in Grenada we require a *market* for our fruit, and *regular* and *reliable* means of shipping it to that market. Further it would be advisable to establish a central receiving house, say in St. George's, where the fruit could be properly selected and packed for the home market. This could be established by any enterprising local firm, or even by the Government.

With these inducements local men would pay attention to fruit cultivation, and an abundant supply of fruit could be shipped from here all the year round. Pamphlets could also be distributed throughout the country giving hints as to the best modes of cultivation, &c.

The importation of fruit into this Colony is confined almost entirely to crystallized fruits and English fruits in syrups ; occasionally a few Apples find their way here from America, but the quantity is very small. The value of preserved fruits imported was, in 1880, 180*l.* 18*s.* 10*d.*, and, in 1881, 50*l.* 5*s.* 9*d.* ; since this no record appears in the Blue Book.

I do not think there are any very special points of interest connected with the fruits of the Colony, excepting the enormous variety grown here and the general good quality of the fruit produced. Sweet Oranges, Tangerine Oranges, and Mandarin Oranges are of very good quality, and the two latter varieties would find a ready sale in the English market.

I would venture to draw attention to the peculiar adaptability of the country to fruit cultivation. There are hundreds of acres of land unsuited to cocoa on which fruit could be grown abundantly and profitably.

Tobago.

The following is a list of the chief fruits grown in Tobago in the order of their importance or extent:—

Cocoa-nut	*Cocos nucifera.*
Lime	*Citrus Medica*, var. *acida.*
Mango	*Mangifera indica.*
Tamarind	*Tamarindus indica.*
Guava	*Psidium Guava.*
Pine Apple	*Ananas sativa.*
Bananas	*Musa sapientum.*
Sapodilla	*Achras Sapota.*
Orange, Sweet	*Citrus Aurantium.*
Shaddock	*Citrus decumana.*
Lemon	*Citrus Medica*, var. *Limonum.*
Seville Orange	*Citrus Aurantium.*
Citron	*Citrus Medica.*
Forbidden Fruit	*Citrus decumama*, var.
Grape Fruit	,, ,, ,,
Sugar Apple	*Anona squamosa.*
Custard Apple	*Anona reticulata.*
Sour Sop	*Anona muricata.*
Jamaica Plum	*Spondias purpurea.*
Hog Plum	*Spondias lutea.*
Chili Plum	*Spondias* sp.
Governor Plum	*Chrysophyllum oliviforme.*
Avocado Pear	*Persea gratissima.*
Cherry	*Malpighia punicifolia.*
Otaheite Gooseberry	*Cicca disticha.*
Star Apple	*Chrysophyllum Cainito.*
Mammee Sapota	*Lucuma mammosa.*
Cashew	*Anacardium occidentale.*
Pomegranate	*Punica Granatum.*
Almond	*Terminalia Catappa.*
Granadilla	*Passiflora macrocarpa.*
Water Lemon	*Passiflora laurifolia.*
Genip	*Melicocca bijuga.*
Tomato	*Lycopersicum esculentum.*
Grape	*Vitis vinifera.*
Seaside Grape	*Coccoloba uvifera.*
Bread Fruit	*Artocarpus incisa.*
Jack Fruit	,, *integrifolia.*
Golden Apple	*Spondias lutea.*
Ground Nut	*Arachis hypogæa.*
Akee	*Blighia sapida.*
Water Melon	*Citrullus vulgaris.*

Such fruits as would be suitable for export mostly ripen from May to August. Oranges about Christmas. The Cocoa-nut is the only one on the list which may be considered an export from Tobago. The average value may be quoted at 10 dollars a thousand, and the average export at 750,000 per annum. Limes, or rather the expressed juice, has been exported to some extent; but the low price in home market does not encourage expenditure of capital in that direction. Mangoes are sent during the season to Barbados, where they meet with ready sale.

Pine Apples grow readily, and a few have been sent home preserved in tins. Tamarinds in syrup are sent home in small quantities every crop. Bananas also grow readily all over the island, and some have been sent to Trinidad, and other places.

All the principal fruits, as Mangoes, Pine Apples, Sapodilla, Bananas, Oranges, &c., &c., ought to be produced in much larger quantities than at present, but up to the present time there has been no available market for them. The first thing that is wanted is a quick and cheap transport to a market by means that can be depended on for punctuality and despatch, and improved means of communication locally from one part of the island to another. It is said that in Jamaica arrangements have been made by which Bananas can be put on board the steamers for America, from the out-bays, at 1*d*. per bunch. Cable communication would be necessary, to afford due notice of the approach of the fruit-carrying steamers, thus permitting the picking to be delayed to the latest possible moment, so that the fruit might be shipped in the freshest condition.

The only fruits imported are American tinned and English bottled tart fruits, and these only in small quantities.

A large variety of fruits can be produced in the Colony of the finest quality, if due attention be paid to cultivation. Land is very cheap, and much of it is now in the market. Capital is required. A company formed with the view of fruit growing and tinning would be sure of success.

The above Report was prepared by a Committee of the Tobago Agricultural Society, consisting of Messrs. John McKillop, Edward Keens, and D. McGillivray.

In a despatch from the Administrator of Tobago to the Governor-in-Chief of the Windward Islands, dated 26th September 1887, it is stated that “Tobago can produce fruit as fine as any other island, but its “geographical position at the end of the group, outside the circle, has “always been a bar to its advancement. Fruit for New York from “Tobago would have to compete against fruit picked some 10 days “later in the more northern islands.”

TRINIDAD.

The following particulars respecting the fruits of Trinidad was compiled last year by Mr. J. F. A. Redhead, Acting Superintendent of the Botanic Gardens:—

Local Names.	Months during which they are obtainable.	Wholesale Prices Locally.
Orange - - -	October to January -	1*s*. a hundred.
,, Mandarin -	,, ,, -	,, ,,
,, Tangerin - -	,, ,, -	,, ,,
,, Portugal - -	,, ,, -	,, ,,
Forbidden Fruit - -	,, ,, -	1*s*. 6*d*. ,,
Shaddock - - -	,, ,, -	3*d*. to 5*d*. each.
Pine Apple - -	April to June - -	3*d*. to 1*s*. each.
Sapodilla - - -	February to July -	2*s*. a hundred.
Mango - - -	June to July - -	1*s*. 4*d*. a hundred.
Avocado Pear - -	July to November -	4*s*. ,,
Granadilla - -	October to November -	3*d*. to 6*d*. each.
Water Lemon - -	June and July - -	1*s*. 4*d*. a hundred.
Water Melon - -	June to August - -	3*d*. to 5*d*. each.
Banana - - -	All the year - -	According to quality, say 1*s*. 6*d*. a hundred.
Tamarind - - -	January to March -	4*s*. to 16*s*. a tree crop.
Mammee Apple - -	March to May - -	2*s*. a hundred.
Guava - - -	August to November -	About 6*d*. a hundred.

As regards the steps necessary to start and develope a fruit trade in Trinidad, the most important is good communication with European and American markets by means of vessels fitted especially for carrying fruit. Information is necessary as regards the prices which fruits are likely to realise in foreign markets, and as regards the best manner of packing them, the seasons at which they would command the highest prices, and the quantities likely to be required at each shipment.

Since the above information was received, Mr. Hart has prepared a pamphlet on "The Banana Trade" at Trinidad, in which he has fully discussed the steps necessary to establish a fruit industry in the island.

BRITISH GUIANA.

The following report on the fruit productions and resources of British Guiana has been prepared by Mr. G. S. Jenman, Government Botanist and Superintendent of the Botanical Gardens at Georgetown :—

PREFATORY REMARKS.

The export of fruit from the Colony is so small that it is only worth considering as evidence that on a much larger scale a profitable export trade in fruit might be created if the necessary arrangements were made for the extension of the trade. With this exception it may be said that fruit is only grown to meet the local demand, and the extent of this demand is so well known to growers that only under exceptional circumstances of depression in the sugar industry, or seasons that affect unusually favourably the production of certain fruits, is there ever an excess over the demand. I will review each of the principal fruits separately presently, but it may be said generally here that were there a larger permanent demand, it is very probable, with little effort, the supply would increase to the same extent, the necessary time being allowed for the growth. In the country districts the majority of families have the opportunity of obtaining the common fruits, such as Plantains, Bananas, and Mangoes; but in districts where the population is sparse and widely scattered, this is not generally accomplished easily, and long distances have often, where the people are not cultivating on their own account, to be traversed to the localities where roadside markets are made on certain days, usually only Saturday, to obtain supplies. The towns and large villages would, too, probably consume a larger quantity of fruit, were it made more easily available by a good system of distribution. There is a small importation of fruit from the West Indies with the ground-provisions that are imported, but it is inconsiderable. At the height of the apple season this fruit is imported to the extent that it is as common in Georgetown as, perhaps, any of the native fruits are in their season, if indeed it is not more abundant than several of them, judging from what one sees of it in the market streets; but its greater powers of keeping may probably, however, deceive one as to the quantity actually imported. Of such importation no separate record is kept at the Customs, all being there included under the head that covers small items generally of "free unenumerated goods." All this, however, shows that the local supply of fruit might still be increased, under favouring circumstances, for its distribution for local use. A considerable portion of the fruit brought from the country districts to Georgetown market for sale is taken by the shipping in the port.

List of the FRUITS cultivated in BRITISH GUIANA, arranged in the sequence of the Quantity grown for local consumption or export.

Common Name.	Scientific Name.	Principal Season.	Amount available for Export.	Wholesale Price.*	Retail Price.*
Plantain	*Musa sapientum*	January to December	Small quantity	24 cents to 72 cents per bunch.	32 cents to 84 cents per bunch.
Banana	,, ,,	January to December	Small quantity	10 cents to 20 cents per bunch.	16 cents to 24 cents per bunch.
Mango	*Mangifera indica*	November to February	Varies with season	Varies with the crop	Varies with the crop.
Guava	*Psidium Guava*	June to October	Small quantity	12 cents to 24 cents per bushel.	2 cents for 6 to 24.
Orange	*Citrus Aurantium*	August to December	Hardly any at present	45 cents to 90 cents per 100.	50 cents to $100 per 100.
Cocoa-nut	*Cocos nucifera*	January to December	Considerable	$10 to $15 per thousand	2 cents to 3 cents each.
Pine Apple	*Ananas sativa*	March to August	Hardly any at present	2 cents to 16 cents each	6 cents to 36 cents each.
Star Apple	*Chrysophyllum Cainito*	October to December	None	4 cents to 8 cents per doz.	1 cent each.
Sapodilla	*Sapota Achras*	May to December	None	12 cents to 16 cents per dozen.	2 cents each.
Granadilla	*Passiflora quadrangularis.*	July to September	None	2 cents to 4 cents each	4 cents to 8 cents each.
Scimitoo	,, *laurifolia*	January to December	Hardly any	24 cents per bushel	1 cent for 6 to 12.
Sour Sop	*Anona muricata*	January to December	None	16 cents to 24 cents per dozen.	2 cent to 4 cents each.
Avocado Pear	*Persea gratissima*	July to December	None	24 cents to 48 cents per doz.	4 cents to 8 cents each.
Bell Apple	*Passiflora maliformis*	July to November	Hardly any	12 cents to 24 cents per bushel.	4 to 8 for 2 cents.
Cashew	*Anacardium occidentale*	July to December	Hardly any	12 to 24 for 2 cents.	6 to 12 for 2 cents.
Custard Apple	*Anona reticulate*	Spring and Summer months.	Hardly any	4 for 8 cents	2 to 3 for 8 cents.
Golden Apple	*Spondias dulcis*	September to December	Hardly any	6 to 12 for 8 cents.	4 to 6 for 8 cents.
Governor Plum	*Flacourtia Ramontchi*	February to June	None	Not sold	Not sold.
Hog Plum	*Spondias lutea*	November to March	Not worth exporting	2 to 3 doz. for 2 cents	2 dozen for 2 cents.
Jambolan	*Eugenia Jambolana*	January to March	None	Not sold	Not sold.
Papaw	*Carica Papaya*	January to December	Small quantity	2 to 4 for 2 cents	1 to 2 for 2 cents.
Souarri-nut	*Caryocar nucifera*	June to August	Small quantity	2 to 4 for 8 cents	2 for 8 cents.
Sweet Sop	*Anona squamosa*	Spring and Summer months.	Small quantity	2 to 4 for 8 cents	1 to 2 for 8 cents.
Tamarind	*Tamarindus indica*	October to December	Hardly any	1 to 2 doz. for 2 cents	12 for two cents.
Surinam Cherry	*Malpighia glabra*	January to July	Hardly any	Not sold	Not sold.
Acquero	*Astrocaryum Tucumoides*	September to December	No demand	8 cents to 16 cents a bunch.	1 dozen for 2 cents.
Awarra	,, *Tucuma*	September to December	No demand	8 cents to 16 cents a bunch	1 dozen for 2 cents.

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* These prices fluctuate with the period of, and degree of prolificness of, the season, and can only be regarded as a rough guide.

The small exportation of fruit is confined almost entirely to Plantains and Bananas.

Other Fruits exported are of trifling quantity and average in value little over a hundred dollars a year.

Of *Preserved Fruit* exported the average value is not much over a thousand dollars.

Turning to imported *Fresh Fruit*, I have said there is no separate record kept of this at the Customs. From inquiries I have made of merchants in the trade it seems to about equal the value of the exported fruit. It does not exceed from four thousand to five thousand dollars a year.

The *Preserved Fruit* imported averages in annual value between six thousand and seven thousand dollars.

* * * * *

I append (Appendix B.) a paper entitled "Regarding an Export Fruit Trade," reprinted from the *Argosy* newspaper.* I have shown in that paper that fruit might be largely raised here for export, but before any considerable extension of cultivation takes place, cultivators must be assured of a market for the produce. Shippers are required to afford this market. The cultivators being, as a rule, members of the working classes, living from hand to mouth, they cannot arrange the shipping themselves. I have suggested that a company should be formed to undertake the business, or that Government should give a subsidy for a few years to vessels carrying fruit. If it were seriously taken up and judiciously managed, I believe a very important fruit trade might be established from the Colony, for which none of the British Western Tropical Colonies is in possession of better facilities.

Remarks on the Principal Fruits of Colony.

Plantains.—These being the principal article of food of the negro peasantry, their production comes next to sugar (though insignificant in relation) as one of the staple industries of the Colonies. They are gathered green before maturity, and used as a vegetable, boiled or roasted. Cut when full grown, but while still green, they are used by colonists roasted in ashes. At this period they have a soft mellow, somewhat cheese-like substance. If kept for a week or ten days in store when thus gathered they ripen and turn yellow, acquiring a fruity character. They are then prepared for table by baking in the oven, whole, the skins having first been removed, or are sliced, lengthwise, and fried. In this state they resemble ordinary baked apple, but are sweeter, with a much firmer substance. Were these qualities of this fruit known in temperate countries, I think a demand would arise for it, and it might be made an article of export from the Colony. For this purpose it would have the advantage of the greater hardness it possesses in handling over the Banana. The quantity of fruit produced and consumed in the country must be very great, but there is hardly any means of estimating it. The average number of bunches annually exported is about eight thousand, valued at one thousand three hundred dollars, which are sent to neighbouring countries.

Bananas.—The cultivation is almost confined to supplying the demand for local consumption, but it might be increased to any extent. Several varieties are grown, the smaller kinds, called Figs, being chiefly in demand among the better-to-do classes. The kind apparently in most favour with cultivators and the working classes being the dwarf Chinese; this produces large bunches and is one of the best in keeping, but in quality is not so good as several of the taller growing kinds. I am quite unable to estimate the quantity or value of that locally consumed. That exported I estimate at from 10,000 to 12,000 bunches a year, and in value from $2,000 to $2,500. For full information on the subject of this fruit as an article of export see the paper attached entitled "Regarding an Export Fruit Trade."

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* Not reproduced.

Mangoes.—There is no cultivation in the proper sense of the term of this fruit. From its first introduction to the Colony it was planted on the "Dams" of sugar estates, and the greater part of the trees now growing in the country occupy these situations; and the want of drainage prevents its spreading spontaneously. Fewer trees are in existence now than formerly, for an abundance of Mangoes tend to sustain idleness among the labouring classes; and partly as a consequence of this "fruit walks," as the avenues of fruit trees on the dams were called, are not kept upon many estates now. The Mango in Guiana fruits precariously, a very dry year yields usually a heavy crop, but in ordinary seasons the yield is light. At the former old settlements on the rivers very fine trees are in many places found, but they rarely fruit,—the present occupiers say only about once in seven years, and then only in an exceptionally dry season. This tendency is characteristic of the Mango in all countries to which my experience has extended. The kinds grown here are generally poor, and there is no first-class fruit among them. The Botanic Gardens are endeavouring to remedy this by propagating only good and first-class kinds by grafting (in-arching) and offering them for public sale at a cost to cover expenses. In good mango seasons all classes have an abundance of the fruit. At such times it has hardly any value in country districts where trees are plentiful, and after transport to town, is sold at from one dozen to two dozen for a penny. In less favourable seasons it sells at twice to four times this rate. None is exported. First-class fruit would be worth exporting, but a refrigerator would be required for its safe conveyance. No attempt, however, should be made to export the fruit now available, as its quality is so poor it would only prejudice the market. The difference between poor and good Mangoes is as great as that between crab-apples and the choicest cultivated kinds of that fruit.

Oranges.—Of this fruit there is hardly any real cultivation, nor are trees abundant. The soil and climate appear very favourable, and good crops are generally produced. Trees suffer from the orange scale pest, and individuals often succumb to its ravages. The kinds grown are not all of equal merit, but some are very good. The cultivation might be carried to an indefinite extent. There is no export, and small quantities are sometimes imported from the West Indies.

Limes.—These are not grown largely, but more than sufficient for local demand. In some places dams are planted, and there the fruit is allowed to a large extent to perish on the ground, as there is little demand for it in the local market, and the price realised does not pay carriage to town. A small quantity was exported on trial a short time ago to the United States, fresh, in barrels, upon which, compared to the quantity, there was considerable loss. Lime-trees seem to suffer much more from the orange scale than Orange-trees do, and many from time to time are killed from its attacks. Apart from this pest, the conditions here are favourable, and the cultivation might be multiplied indefinitely. Two or three varieties are grown, one or two of which are very fine fruit.

Pine Apples.—The land of the coast region, a stiff clay, is not suitable for the best growth of this plant. Still a good many fruit are grown on the dams of sugar estates and elsewhere. Some of the best of the

English kinds are among these. The sandy land of the interior, where, by the way, the Pine Apple is plentifully indigenous, is specially adapted to the cultivation. There the Indians grow this fruit more or less plentifully in their provision fields. The area of land, within reasonable distance of the ports of shipment, most thoroughly adapted for the culture of this fruit is very large. None is exported.

Guavas.—These are naturalised in pastures and other places, and consequently are not much cultivated. The greater part of the fruit wastes on the ground or is eaten by animals, but some is made into jelly for local use or for export. The entire quantity used is not however of much consideration. There are three or four varieties, all of which thrive freely on both the coast and interior lands, and might be multiplied indefinitely.

Avocado Pear.—This tree does not thrive so well here as in the West India Islands, and the fruit is, as a rule, expensive. Fine fruit is, however, produced in some places, but is chiefly consumed by the owners, and that which reaches the market is little in quantity and of inferior size and quality. In the principal season there is a small importation from the West India Islands. It thrives better in the more humid climate of the interior, and fine trees stand at some of the old settlements on the rivers.

The other fruits enumerated in the opening table are not of a quality or produced in sufficient quantity to call for detailed remarks.

LONDON: Printed by EYRE and SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 21.] SEPTEMBER. [1888.

LVII.—COLONIAL FRUIT—(continued).

DOMINICA.

The following interesting and valuable Report on the fruits of Dominica has been prepared by Dr. H. A. Alford Nicholls, F.L.S., Government Medical Officer, and a valued correspondent of Kew:—

From the time of its settlement Dominica has been justly celebrated for its fruit. Of all the British Possessions in the Lesser Antilles it is now regarded as having the best promise of the development of a large and remunerative fruit trade, not only with the United States and Canada, but also with Europe. The islands lying between Dominica and the mainland of North America, with the exception perhaps of the small colony of Montserrat, are not adapted for the cultivation of most of the tropical and sub-tropical fruits, by reason of the droughts to which they are sometimes subject. Thus it happens that Dominica is the nearest fruit-producing island of the Lesser Antilles to the United States and Canada, and it is also the nearest of the West Indian fruit

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PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY EYRE AND SPOTTISWOODE,
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1888.

Price Twopence.

islands to Great Britain. This is an important fact in regard to the future of the fruit trade between Great Britain and North America and the Lesser Antilles, for with so perishable an article as fruit even a few hours curtailment of an ocean voyage means sometimes all the difference between profit and loss. Possessing a fertile soil, unsurpassed in any other part of the world, an abundant rainfall, and a wide diversity of climate, owing to the mountainous nature of the country, the capabilities of Dominica for the culture of tropical and sub-tropical fruits can scarcely be over-estimated. There can, therefore, be no doubt that when the natural advantages of the island become more widely known the necessary capital will be found to form farms for the growth of the various fruits and vegetables that can be exported at a profit.

The earliest recorded instance of a trade in Dominica fruits is found in Atwood's history of the island, published in London in 1791. Atwood says, "The Lemon and the Lime Trees bear also very aromatic "scenting blossoms, and the fruit of both is in great abundance, "large, and of excellent quality. Of these, the latter especially, great "quantities are often sent in barrels to England and America. The "neighbouring English islands are likewise often supplied with them "from this country, especially those of Antigua and Barbados." What the old historian of Dominica wrote nearly a century ago is true even now, for quantities of the island fruit are exported not only to England and America but also to many of the neighbouring islands. It was not, however, until recent years that fruit became a regular article of export from the Colony, for the successful prosecution of such an industry requires experience in what is styled "the handling" of the fruit, experience also in the various systems of packing, and a knowledge of the requirements of the markets abroad. In past times American schooners used to come to Roseau, the chief port of Dominica, for Oranges, but owing to ignorance of the buyers and sellers the ventures did not pay; and it is scarcely to be wondered at, as the Oranges were knocked off the trees, and the bruised fruit was shipped roughly in bulk in the hold of the vessel, with the result that most of it became rotten long before its port of destination was reached. As a case in point it may be mentioned that the Blue Books show that in the year 1851 the fruit exports from the island are estimated at 703*l*., which sum includes 115*l*., the value of the Lime juice exported that year. With the exception of 1,019,800 Oranges shipped to the United States, and valued at 489*l*., there are no details given of the kinds of fruit exported; and as no more Oranges were shipped to America until many years afterwards, it must be assumed that the venture was not a paying one. About 14 years ago, with a view of demonstrating the capabilities of the island for a fruit trade, I made a few trial shipments of Oranges and Shaddocks to Messrs. Keeling and Hunt, of Monument Yard, London. Notwithstanding the long voyage by the Royal Mail steamers, longer in point of time than it is now, and the transhipments at Barbados and St. Thomas, the fruit, which was carefully selected and packed, arrived in London in excellent condition, and fetched the highest price in the market, where it was then somewhat scarce, and as a consequence the results of the shipments showed a large profit on the outlay. I showed several of our local merchants the account sales, but nothing was done to prosecute the trade, and things went on in their usual style, for Oranges appear in the official lists of exports for the years 1876 and 1877, and they then disappear again, as might be expected, for the shipments could not possibly have paid owing to the rough handling of the fruit. Probably there would have been no considerable fruit trade in Dominica now but for the enterprise of some Americans who came to the island in the proper season, bought up Oranges and other kinds of fruit, and shipped them to the New York market. These Americans went the right way to work. They refused to purchase Oranges that did not have the stalks attached and properly cut, and in this way they ensured, to a great extent, the proper hand-picking of the fruit. They rejected with ridicule all bruised fruit, and what they bought they packed carefully in suitable boxes, each Orange having been examined for bruises, and if found sound wrapped in paper specially imported for the purpose. The result was a revolution in the desultory and insignificant fruit trade of the island. The Americans came back year after year, thereby showing the people that the trade was successful, and then local men began to take up the matter, with the result that at the present time the Americans have to compete with resident shippers.

With the exception of the Limes, which are extensively grown in the island for the sake of their juice, and the Bananas, which are cultivated by the peasants, the greater part of the fruit shipped from the island is gathered from trees that have grown up, in most cases accidentally, in gardens, in odd corners of estates, and by the roadside. Considering that the exports of fruit, excluding Lime juice and other fruit products, now reach in value a good deal over 1,000*l.* a year, or about one forty-eighth of the total value of the exports of the island these facts are very striking, and they are pregnant with promise for the future of the trade. Some of the planters and peasant proprietors are now turning their attention to the systematic cultivation of Oranges, Shaddocks, and other fruit trees on a small scale, but the only estates in the island devoted entirely to fruit culture are those belonging to the Lime planters, who do not, however, ship the fruit in its natural condition in any considerable quantity.

The chief fruits exported from the island are Oranges, Coco-nuts, Bananas, Limes (both fresh and pickled in brine), Mangoes, Shaddocks, and Pine Apples. The Tamarind is exported in a preserved state, but it is only when the prices are high in the home market that local shippers consider it worth their while to ship this article, and thus the quantity exported varies considerably year by year. The juice of the Lime (both fresh and concentrated) has become a very important export from the island, and any account of the fruit trade would be incomplete without some details of the industry, which was started in Dominica years ago by the late Dr. Imray, to whom the island owes, on that account alone, an everlasting debt of gratitude. The Lime, which is the fruit of a tree closely allied to the Orange and Lemon, has done much to help to revive the prosperity of Dominica; and, as the industry is constantly growing, it gives promise of great things in the future. In addition to the juice of the fruit, a very fragrant essential oil, called commercially the "essential oil of limes," is obtained from the rind of the fruit. This oil is not yet very well known in the trade, but the demand for it is increasing, and the exports of the article are accordingly running up in value. Besides Lime juice, other fruit juice has been exported by one of the planters during the last two years. The principal kind is that obtained from the Pine Apple. It is shipped principally to the United States, and it is used for flavouring purposes.

In order to give a correct idea of the fruit industry in Dominica, I have made a careful examination of the Blue Books kept at Government Office, but as the volume for 1880 is lost, and as no other copy exists in the island, I have been unable to go back for more than seven consecutive years.

VALUE of FRUIT and its PRODUCTS EXPORTED from DOMINICA during the Seven Years ended 1887.

Year.	Fruit.	Tamarinds.	Raw Lime Juice.	Concentrated Lime Juice.	Orange and Pine Apple Juice.	Essential Oil of Limes.	Totals.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1881	164 11 0	386 0 0	41 17 6	6,386 2 0	7 6 0	160 17 6	7,146 14 0
1882	625 0 8	123 0 0	20 14 0	5,081 0 10	—	168 12 0	6,018 7 6
1883	1,523 3 6*	187 0 0	21 18 4	4,597 18 4	—	176 14 0	6,507 4 2
1884	1,807 16 6*	1 0 0	31 3 0	3,234 15 10	—	284 0 0	5,358 15 4
1885	1,027 0 7*	242 3 1	514 18 0	2,737 5 10	—	90 12 0	4,611 19 6
1886	1,220 19 9	193 0 0	415 6 6	4,588 15 0	5 7 0	192 15 0	6,616 3 3
1887	1,157 15 7	32 16 0	512 7 6	7,458 18 0	19 13 0	589 16 0	9,771 6 1
Totals	7,526 7 7	1,165 9 1	1,558 4 10	34,084 15 10	32 6 0	1,663 6 6	46,030 9 10

* In the official returns for these three years fresh fruit and vegetables are included under one head.

As will be seen from this table, the total value of the exports of fruit and fruit products for the seven years amounts to the sum of 46,030*l*. 9*s*. 10*d*. Since it has not been possible, for the reasons given, to obtain any statistics for the year 1880, I have drawn up the following table showing the value of the same articles exported during the seven years ended 1879, and a comparison of the two tables will conclusively show the satisfactory progress made in the prosecution of the fruit industry notwithstanding the many disadvantages that the shippers and growers have had to contend with.

VALUE of FRUIT and its PRODUCTS EXPORTED from DOMINICA during the Seven Years ended 1879.

Year.	Fruit.	Tamarinds.	Raw Lime Juice.	Concentrated Lime Juice.	Orange and Pine Apple Juice.	Orange Peel.	Essential Oil of Limes.	Totals.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1873	38 16 7	173 8 0	783 3 8*		—	1 0 0	—	996 8 3
1874	25 5 0	252 16 6	1,600 16 8*		6 10 0	0 4 0	—	1,885 12 2
1875	106 19 2	168 10 0	132 15 0	1,690 18 6	—	17 10 0	—	2,116 12 8
1876	107 9 11	148 1 0	135 2 4	1,699 3 4	4 0 0	0 3 6	27 0 0	2,121 0 1
1877	234 0 0	219 14 0	36 0 0	1,557 10 0	—	—	80 0 0	2,127 4 0
1878	72 18 4	297 1 0	187 7 0	2,079 12 0	0 5 0	199 0 0	156 0 0	2,992 3 4
1879	2 0 0	486 6 0	76 5 6	3,078 12 0	10 0 0	16 5 0	100 0 0	3,769 8 6
Totals	587 9 0	1,745 16 6	13,057 6 0		20 15 0	234 2 6	363 0 0	16,008 9 0

* It was not until 1875 that any distinction was made in the official list of exports between raw and concentrated Lime juice. Both are included under the head "Lime juice."

Until the year 1886 the various kinds of fruit exported from the island were not enumerated in the official returns; but, except in the case of Coco-nuts, were all included under the headings "fresh fruit" or "fresh fruit and vegetables." I pointed out, however, in 1886 to Mr. U. Murrain, the Chief Clerk in the Treasury Department, the advantage for statistical purposes in keeping proper records of the progress of a new and growing industry, and since then that gentleman has entered the fruit exports in detail in the Blue Books. Thus I have been able to compile the following interesting table, which shows the kinds of fruit exported during the last two years, their estimated value, and the countries to which they have been exported. (*See next page.*)

This table shows that a considerable trade in fruit is carried on between Dominica and the neighbouring islands—English, French, and Danish, more especially those lying between Dominica and the United States. Indeed as far as the northern Islands are concerned Dominica may fitly be described as their orchard. The commencement of a trade, too, has been made with the United Kingdom; and, as I understand that the fruit shipped to London was, in most instances, sold at a profit, it is to be hoped that there is here the germ of a regular trade between the mother country and this fine but neglected island. As will be noticed from the table, nearly half of the total exports goes to the United States, the Quebec Steamship Company and their officers having done all in their power to facilitate and to foster the trade, and I would here remark that it is to be regretted that the Royal Mail Steamship Company are not equally anxious to foster this local industry.

Particulars of the fruit exports are given in the table under nine heads, but two of them, namely, Limes and Pickled Limes, are essentially the same, the latter being simply ripe Limes packed in brine, which preserves them remarkably well for a long time.

The following are the average prices from which the values have been officially estimated:—

	s.	*d.*
Bananas, per bunch - - - -	0	6
Coco-nuts, per barrel - - -	8	4
Fresh Limes, per barrel - - -	7	6
Pickled Limes, per barrel - - -	8	4
Mangoes, per hundred - - -	1	0
Oranges, per hundred - - -	1	0
Pine Apples, per barrel - - -	8	4
Shaddocks, per barrel - - -	8	4
Non-enumerated fruits, per barrel - -	5	0

It must be remembered, however, that this valuation is for fruit properly pickled, selected, and packed, ready for export, and it includes the cost of packages and packing. In bulk the fruit can be bought much cheaper. Thus, selected and hand-picked Oranges can be purchased at 9*d.* a hundred, and Limes at 4*s.* a barrel, and it would doubtless pay some London fruiterer to visit Dominica in the fruit season in order to buy up fruit for export.

Under the head of "non-enumerated fruits" are included a great number of various kinds other than those mentioned in the eight foregoing columns of the table. Perhaps, for its size, Dominica produces a larger and more varied number of fruits than any other part of the tropics. I have made the following list of 60 kinds of fruit that are grown in the island; and, in order to make the list as useful as possible, I have given the local names, the botanical names, and the habitat of the plants producing the fruits, as well as the season during which each kind is plentiful, and I have added such special information as appeared to me to be necessary. Each plant has been placed under its natural order, as such a classification is perhaps the easiest for reference.

Table showing the **Value** of the different kinds of **Fruit Exported** from **Dominica** during the Years 1886–87, and the Countries to which the Fruit was Exported.

Names of Countries.	Oranges.			Coco-nuts.			Bananas.			Limes.			Limes Pickled.			Mangoes.			Shaddocks.			Pine Apples.			Uuenumerated Fruits.			Total Value.		
	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
United States	867	17	5	33	15	0	10	1	0	76	10	0	74	11	8		—		48	4	7	1	5	0	4	14	2	1,116	18	10
Antigua	6	9	6	270	15	2	136	17	6		—			—		19	11	8		—			—		9	12	6	443	6	4
Guadeloupe		—		117	11	8	18	4	0		—			—			—			—		1	5	0	0	12	6	197	13	2
St. Kitts	13	15	0	125	19	4	30	4	0	2	12	6		—		0	8	4		—			—			—		172	19	2
St. Croix	3	10	0	30	6	11	102	0	6		—			—		9	7	6		—		2	1	4	1	5	0	148	11	3
United Kingdom	49	11	8		—		0	6	0	9	15	0	8	15	0		—		3	6	8	1	16	8	7	19	2	81	10	2
Barbados	12	18	0	3	14	0	2	0	6	3	7	6		—		2	10	0		—		2	8	0	26	1	8	52	19	8
St. Thomas	5	3	0	18	15	0	69	15	0		—			—		18	6	8		—			—		1	0	10	113	0	6
St. Martin's	17	1	6	7	12	9	7	10	0		—			—			—			—			—		0	8	4	32	12	7
St. Bartholomew		—		4	3	4	1	17	6		—			—			—			—			—			—		6	0	10
British North America	5	0	0		—			—			—			—			—			—			—			—		5	0	0
Grenada		—			—		3	9	6		—			—			—			—			—			—		3	9	6
Martinique		—			—			—		2	12	6		—			—			—			—		1	4	2	3	16	8
Montserrat		—		0	16	8		—			—			—			—			—			—			—		0	16	8
Totals	981	6	1	673	9	10	382	5	6	94	17	6	83	6	8	50	4	2	51	11	3	8	16	0	52	18	4	2,378	15	4

ANONACEÆ.

1. **Sour Sop** (*Anona muricata*).—Habitat, West Indies. Season, May to October, but it may be obtained in small quantities during the greater part of the year. It is a large fruit with a hard green skin and a soft pulp of a pleasant acid flavour. The pulp, which is white, is sometimes mixed with sugar and water and it then makes a delicious drink during hot weather. The fruit is quite common in the island, the tree bearing it growing wild in many places.

2. **Custard Apple** (*Anona reticulata*).—Habitat, West Indies. Season, October to February. This fine fruit occurs abundantly, and like the Sour Sop it grows wild in many places. It has a sweetish pulp of a pleasant flavour, which is also sometimes made into "Custard Apple drink."

3. **Sugar Apple** (*Anona squamosa*). — Habitat, West Indies. Season, June to August. This fruit is abundant and its pleasant sweet pulp is much esteemed. Were fruit steamers with cold chambers to run between the Antilles and London, Sugar Apples, Sour Sops, and Custard Apples could easily be delivered in good condition at the home markets, where they would doubtless meet with a ready sale.

MALVACEÆ.

4. **Sorrel** (*Hibiscus Sabdariffa*).—Habitat, North Africa. Season, November to January. This fruit, the produce of an annual, is common in the island. It makes an excellent jam, and it is used for tarts, pies, &c. A very pleasant beverage, called "Sorrel drink" is also made from it in the following manner. The Sorrel capsules, with a little spice to taste, are boiled with water until they become pulpy. The next day the pulp is strained out, and the resulting clear fluid is sweetened with sugar, bottled off, and allowed to remain until slight fermentation sets up, when it is ready for use.

GUTTIFERÆ.

5. **Mammee Apple** (*Mammea americana*).—Habitat, West Indies. Seasons, March to May and August to December. Occurs in abundance, and is exported in small quantities to the neighbouring islands and to America. The fruit has a thick leathery rind, and four large seeds which are covered with a dense pulp having somewhat the flavour of an Apricot. In fact the fruit is called "Zabricot" by the natives.

MALPIGHIACEÆ.

6. **Barbados Cherry** (*Malpighia punicifolia*).—Habitat, West Indies. Season, May to September. The tree bearing this fruit is very common in the island. The "Cherries" are used extensively for making jams, and they are also candied with sugar. The fruit could be exported only in cold chambers.

7. **Surinam Cherry** (*Malpighia glabra*). — Habitat, South America. Season, April to July. This fruit is not grown to any extent in the island, for as it has somewhat of an aromatic taste, it is not much liked except by a few persons.

AURANTIACEÆ.

8. **Citron** (*Citrus Medica*).—Habitat, India, but naturalised in the West Indies. The Citron grows well in the island, but it is not very common as the fruit is used only in small quantities for the purpose of

making the well known candied Citron peel. Some years ago, one of our shippers exported to America a few barrels of the rind preserved in brine, and he informed me that the article sold readily at a profit, but that he gave up the venture as he could not obtain a sufficient number of the fruits. The Citron is cultivated very extensively in Corsica, where the fruit is called "Cedrat," and the industry there is a very paying one. There is no reason whatever why it should not pay equally well in Dominica, should any person be enterprising enough to "go in" for the culture.

9. **Lemon** (*Citrus Medica*, var. *Limonum*).—Habitat, East Indies, but naturalised in the West Indies. Season, June to February. This fruit is rather scarce, but it grows well in the island and can be propagated quickly. Several large varieties occur, and, although the fruit itself is too coarse to be useful for export, the rind is valuable for the purpose of making the Candied Lemon Peel of commerce. A very fragrant essential oil is also obtained from the rind.

10. **Orange.** (*Citrus Aurantium*).—Habitat, East Indies, but naturalised in the West Indies. Season, September to February, but some of the trees bear much earlier than September. The Orange is almost wild in Dominica. It springs up wherever the seeds are thrown, and the seeds are often carried to odd places by birds. After the Lime, the Orange is the most important of Dominica fruits. The list of exports shows that during the years 1886–87 Oranges to the value of 981*l*. 6*s*. 1*d*. were exported from the island, and yet not one of the trees bearing this fruit was planted, it may safely be said, with a view to the export of the produce. This interesting fact is significant, and it is a clear indication of what the island is capable of doing. The trees are raised from seed, and contrary to what I have often read, I find that they "breed true." Dominica seedling Oranges, or rather the best kinds of them, cannot be surpassed anywhere for lusciousness, sweetness, and delicacy of flavour.

11. **Sweet Lime.** (*Citrus Medica*. var. *Limetta*).—Habitat, East Indies. Season, June to January. This delicious Orange is much smaller than the common kind. It has a thin smooth rind and a sweet pulp. It is grown rather extensively, but most of the fruit is bought up in the island, as it is considered one of the best of the Orange family in Dominica. But for the flavour the fruit is exactly like the Lime to which it is closely allied.

12. **Tangerine Orange** (*Citrus nobilis*, var. *Tangerina*). — Season, June to January. This fine and well known fruit is quite common in the island and could be exported in quantity.

13. **Seville Orange** (*Citrus Aurantium*).—Habitat, India, but naturalised in the West Indies. Season, June to February. The Seville Orange occurs in abundance and it is used extensively for making marmalade. The rind is the source of the Orange-peel of the druggists and it is the aurantii cortex of the British Pharmacopœa. A valuable essential oil is also obtained from the skin by distillation, and it is sometimes exported from the island. The peel used to be shipped, but it has not been exported lately. In 1878, as will be seen on reference to the table of fruit exports, the shipments of this article were valued at 199*l*.

14. **Lime** (*Citrus Medica*, var. *acida*).—Habitat, India, naturalised in the West Indies. Season, June to February, but Limes in more or less quantity can be got in Dominica all the year round. After Sugar products and Cacao, Lime juice is now the most considerable export from Dominica. Several estates are devoted entirely to the culture of

the tree, and there are in all of them factories for the concentration of the juice which, in this form, is shipped to England and to America, and is the source of much of the citric acid manufactured there. The juice is usually concentrated from 10 or 12 to 1, when it becomes a dark stuff like in appearance to molasses. The exports of the raw or natural fruit juice are increasing, as are those of the essential oil obtained from the skin of the ripe Limes. As soon as this fruit becomes better known in England it will doubtless to a great extent replace the Lemon of Southern Europe. It is certainly a better fruit, and it contains more juice. At the time of the Colonial and Indian Exhibition, at the request of Sir Augustus Adderley, I shipped a good many of our fruits to the Exhibition market. The Limes sold at the rate of 30*s.* a barrel, and I am told that they sometimes fetch this price at New York. But last year I sent a small consignment as an experiment to a firm in London, and they had difficulty in disposing of it at a price which did not cover the cost.

15. **Shaddock** (*Citrus decumana*).—Habitat, India, naturalised in the West Indies. Season, October to February. This fruit occurs in abundance, and it is now regularly exported. There are several varieties of various sizes. One kind has a reddish pulp and another kind has a whitish one. Owing to the extreme thickness of the skin, the fruit keeps fresh for a long time and it bears the long voyage to Europe remarkably well.

16. **Forbidden Fruit or Pomelo** (*Citrus decumana*, var. *Paradisi*).—Habitat, India. Season, June to February. This fruit is not abundant as there is no particular demand for it; but it grows well in the island, and could be exported in large quantities.

OXALIDEÆ.

17. **Carambo** (*Averrhoa Carambola*). — Habitat, Asia. Season, November to February. Introduced this fruit into the island some years ago from the Trinidad Botanic Gardens, it has taken well to the soil and climate, and it bears abundantly.

AMPELIDEÆ.

18. **Grape** (*Vitis vinifera*).—Habitat, Asia. Seasons, January to March and October to December. The Grape-vine grows very well in the island, and considerable quantities of the fruit could be raised for the early markets in America and England if Messrs. Scrutton's system of carrying fruit in cold chambers of their steamers be regularly followed. In Dominica the vines can be made practically to bear at the will of the gardener, as flowers are put out after each pruning, and if the vines be not pruned they will remain sterile for long periods. A large green grape is the kind most frequently cultivated, but it has been long in the island, and the influence of soil and climate has no doubt obliterated entirely or obscured beyond recognition the characters of the original variety.

TEREBINTHACEÆ.

19. **Plum** (*Spondias purpurea*).—Habitat, West Indies. Season, May to August. The finer varieties of this fruit are much liked by many persons. The tree bearing the plum is quite common, and it is easily propagated by simply cutting off a branch and planting it in the ground during wet weather, when it soon takes root. A yellow species, *Spondias lutea*, is also grown, but it is not so good a fruit as the Purple Plum.

20. **Golden Apple,** or **Pomme Cythère** (*Spondias dulcis*).—Habitat, Society Islands. Season, July to September. This fruit is common in the island, and it is esteemed by the people. It could, however, be exported in cold chambers only, as it soon spoils after ripening.

21. **Mango** (*Mangifera indica*). — Habitat, East Indies, but naturalised throughout the West Indies and South America. Season, April to October. The supply of Mangoes in the island is practically unlimited, for the tree is one of the commonest in the lowlands. The people being very fond of the fruit—indeed, in the season it forms an important part of their food—they eat it whilst walking along the roads, and throw the seeds away. The seeds soon germinate, and as the seedlings are very hardy the tree springs up in all directions, and it is found by the sides of all the roads and paths. There are many varieties of the Mango in the island, the grafted kinds yielding the best and most luscious fruits. As will be seen from the table of exports, large numbers of Mangoes are shipped to the neighbouring islands.

22. **Cashew** and **Cashew Nut** (*Anacardium occidentale*).—Habitat, West Indies. Season, May to September. The Cashew tree is wild in the island, and it gives practically two "fruits"—the Nut and the "Apple." The latter is simply the large pear-shaped swollen receptacle of the Nut, called by botanists a pedicel. It has a pleasant acid astringent flavour, and is liked by many persons. It contains much juice, which in Brazil is made into an excellent wine. The nuts are roasted, in order to destroy an acrid oil which pervades them. They are shipped from the island in small quantities to the neighbouring islands and to Europe. The nut is an excellent one, and the trade might be greatly increased.

LEGUMINOSÆ.

23. **Ground Nut.** (*Arachis hypogæa.*)—Habitat, West Africa. Season, April to June. This nut is cultivated in the island in small quantities only for local consumption. It grows well, bears abundantly, and the cultivation could be indefinitely extended. It is the principle export from the settlements at the Gambia, whence the nuts are shipped to Marseilles and there made into "olive oil!" A good deal of this spurious olive oil is imported into Dominica and other West Indian islands, and it would, doubtless, pay well to cultivate the nut and make the oil on the spot, and thus save half a dozen profits to the consumer.

24. **Tamarind.** (*Tamarindus indica.*)—Habitat, East Indies. Season, July to September. The Tamarind occurs in great abundance in the island; and, as I have shown, it is a constant article of export in its preserved state. The fruit is too acid to be eaten raw. It is candied or preserved in syrup. The common commercial article, known as "Tamarinds" is simply the ripe fruit deprived of its shell and packed into barrels, into which afterwards molasses is run and finds its way after a time into all the interstices of the fruit.

CHRYSOBALANEÆ.

25. **Zicack.** (*Chrysobalanus Icaco.*) — Habitat, West Indies. Season, November to January. This fruit is wild, and the shrub bearing it grows along the sea shore, and a little way in the interior. It is not much esteemed, but many persons like the flavour. It is sometimes called "fat pork" in consequence of the likeness of the pulp to the fat of pork. It would make excellent candied fruit.

ROSACEÆ.

26. **Fraisè, or Redberry.** (*Rubus rosæfolius.*) — Habitat, Northern India. Seasons, April to September. This fruit, which evidently escaped from cultivation many years ago is now wild, and occurs abundantly along the roadsides in several districts of the island. By careful cultivation it might be so improved as to make a very fine fruit; but, in its wild condition, it is too full of seeds to entitle it to take high rank. It is eaten with cream like strawberries, and is also made into jam.

27. **Strawberry.** (*Fragaria vesca.*)—Habitat, Europe. Season, May to July. This delicious fruit is scarce in the island, but it grows well in the mountains, and it even bears in the lowlands. The fruit is not nearly so fine as the European and American varities, but this is probably due to the fact that no attention has been directed to the cultivation of the better kinds.

28. **Loquat.** (*Eriobçtrya japonica.*)—Habitat, Japan. Season, April to July. The Loquat is rather rare in Dominica now, for it has been introduced into the island only within the last few years, but the tree grows well, and I have seen it springing up in several out-of-the-way places.

MYRTACEÆ.

29. **Governor Plum.** (*Eugenia Jambolana.*)—Habitat, East Indies. Season, July to September. This fruit has not long been introduced into the island, and it is therefore scarce now, but the trees are being propagated, as the fruit is much liked.

30. **Malay Apple.** (*Eugenia malaccensis.*)—Habitat, East Indies. Season, August to November. This fruit is rare in the island, but it could be grown in quantity were there any foreign demand for it.

31. **Rose Apple.** (*Eugenia Jambos.*)—Habitat, West Indies. Season, August to September. This fruit is common in the hills. The trees were used formerly as protective belts for coffee plantations. The fruit is a good one, the flavour being somewhat like that of rose water, and hence its name. It makes an excellent preserve.

32. **Guava.** (*Psidium Guava.*)—Habitat, West Indies. This is, perhaps, with the exception of the lime, the commonest fruit in Dominica. It can be obtained all the year round, but it is in greatest abundance between December and May. It is not cultivated, as it is endemic on the lowlands near the coast. Indeed the guava scrub soon takes possession of any of the lowlands left out of cultivation. Frugivorous birds are very fond of the fruit, and, as the small hard seeds are unaffected by the digestive juices, the birds are the principal agents in the distribution of the plants. There are several varities of this guava. One called the Cayenne guava is a fine large fruit, and the commonest kinds are all very pleasant to the taste. The fruit makes excellent jams and jellies, which might be exported in considerable quantities were any person to take up the manufacture with a view to commercial profit.

33. **Purple Guava.** (*Guava Cattleianum.*)—Habitat, South America. Season, June to December. This fruit is smaller, but much superior in flavour to the common guava. It is not, however, abundant in the island.

34. **Pomegranate.** (*Pumica Granatum.*)—Habitat, North Africa. Season, April to July. This well-known fruit is common, and it grows to a large size in the island. It could easily be exported to Europe and America, but I believe that no attempt has been made to do so as yet. The rind is much used locally to make a decoction which is deservedly esteemed as a valuable remedy in chronic diarrhœa and dysentery.

COMBRETACEÆ.

35. **Almond** (*Terminalia Catappa*). — Habitat, West Indies. Season, April to June. This fruit is not much eaten, although it occurs in abundance. The flavour is not unlike that of the Filbert.

CUCURBITACEÆ.

36. **Musk Melon** (*Cucumis Melo*).—Habitat, Asia Minor. This fruit is rather rare, but it grows well in the island and could be cultivated for export in large quantities.

37. **Water Melon** (*Citrullus vulgaris*).—Habitat, North Africa. The Water Melon is not cultivated in Dominica to any extent, but it thrives well, and the vine bears abundantly.

PAPAYACEÆ.

38. **Papaw** (*Carica Papaya*).—Habitat, West Indies. Always in season. The Papaw springs up spontaneously about the cultivated lands on the coast of the island, and the fruit is abundant. It is very pleasant to [the taste, and it acts as a digestive owing to the principle, papain, which it contains. The half ripe fruits on being scratched yield a milky juice, which, when dried, is the drug papayotin from which papain is obtained. Papayotin has been already exported in small quantities, and a sample was shown in the Dominica Court at the Colonial and Indian Exhibition.

PASSIFLOREÆ.

39. **Water Lemon** (*Passiflora laurifolia*).—Habitat, West Indies. Season, April to July. This fruit occurs in great abundance, and the vine bearing it is both wild and cultivated. The fruit lasts very well, and it might be shipped even now to the New York market were ordinary care taken in the packing. It has a very pleasant sub-acid flavour, and it is a general favourite.

40. **Granadilla** (*Passiflora quadrangularis*). — Habitat, West Indies. Season, April to July. This fruit is quite common in the island, but as it does not last long, it could be exported only in vessels with cold chambers.

CACTEÆ.

41. **Prickly Pear** (*Opuntia Tuna* and *Cereus*, various species). —Habitat, West Indies. Season, October to December. The Prickly Pear is obtained from several genera of Cacteæ, and the fruit of all resemble each other. Should a considerable fruit trade be developed, Prickly Pears will doubtless become articles of export.

42. **Barbados Gooseberry** (*Peirescia aculeata*).—Habitat, West Indies. This fruit is rare, the scandent leafy shrub bearing it grows luxuriantly. It makes an excellent jam.

RUBIACEÆ.

43. **Genip** (*Melicocca bijuga*).—Habitat, West Indies. Season, August to October. This fruit is not common, and it is not liked by many persons. It has a leathery rind, and a large hard seed which is surrounded by a thin layer of sweetish pulp. It remains fresh for a long time, and could be easily exported if there were a demand for it.

SAPOTEÆ.

44. **Star Apple** (*Chrysophyllum Cainito*).—Habitat, West Indies. Season, June to August. This fine fruit is rare in Dominica, but it grows well in the island. If it could be introduced into the American and English markets it would, I believe, meet with a ready sale.

45. **Boni** or **Damson Plum** (*Chrysophyllum oliviforme*).—Habitat, West Indies. Season, July to September. The fruit, which is the produce of a large and handsome tree, is sparingly grown.

46. **Sapodilla** (*Sapota Achras*).—Habitat, West Indies. Season, October to January. This fruit is much esteemed and it is abundant during the season. It is usually picked from the tree in a half ripe condition and allowed to ripen in the house, as the frugivorous bats are very fond of it, and they make sad havoc amongst the ripe fruit. Messrs. Scrutton, Sons, and Co., having succeeded in getting this soft and easily spoiled fruit from Demerara to England in excellent condition by means of the cold chamber system, the experiment has really successfully solved the question as to whether the more perishable of the tropical fruits can be placed in the London markets in a fresh state. The next thing to be done is to build up a successful trade in these fruits, and, as Dominica is the nearest tropical country to England capable of supplying fruit in large quantities, it is to be hoped that the fact will be brought to the notice of those interested in the matter.

47. **Balata** (*Bumelia retusa*).—Habitat, Dominica and Jamaica. Season, July to September. This excellent fruit is not cultivated, but is the produce of one of the finest and loftiest hard wood trees of the forests which cover so large an extent of the island. It is as large as a good sized Damson, the skin is yellowish brown, and the pulp is very pleasant to the taste.

POLYGONEÆ.

48. **Seaside Grape** (*Coccoloba uvifera*).—Habitat, West Indies. Season, September and November. This fruit, as its name implies, grows close to the sea-shore. It is a pleasant fruit, and makes an excellent preserve. The fruits are sometimes steeped in rum, in the same way that Cherries are in brandy, and they give a very agreeable flavour to the spirit.

LAURINEÆ.

49. **Avocado Pear** (*Persea gratissima*). — Habitat, South America. Season, August to October. This valuable fruit is very abundant in the island, and it enters largely into the food supply of the people. If steamers with cold chambers for fruit storage were to run regularly between the island and London, the Avocado Pear and other such fruits would undoubtedly after a time become articles of considerable trade with Great Britain.

EUPHORBIACEÆ.

50. **Gooseberry** (*Cicca disticha*). — Habitat, East Indies. Season, August to November. This tree, which, by the way, Grisebach wrongly described as a shrub, is common in the island, and its fruit, which is borne very abundantly, is used principally for making jams and other preserves.

51. **Candle Nut** (*Aleurites triloba*). — Habitat, East Indies. Season, September to December. This tree is rare in the island, but it grows well and bears abundantly. It is called "Candle Nut," because the seeds contain so much oil as to burn brightly like wax candles. The fruit is liked by many persons.

URTICACEÆ.

52. **Fig** (*Ficus Carica*).—Habitat, South Europe, Asia, and North Africa. This delicious fruit is always in season, but less plentiful in the months of April, May, and June. It grows well in Dominica, and might be made of commercial value. The purple variety is the only one that is cultivated in the gardens, but it is, I believe, the best of its kind.

53. **Bread Fruit** (*Artocarpus incisa*).—Habitat, Pacific Islands. Season, November to January. The fruit of this tree is really used as a vegetable in its ripe state, and as it is much liked by the people it is cultivated extensively. It might, therefore, be exported in considerable quantities. The spikes of the male flowers are sometimes candied like the Citron and Lemon-peel, and if introduced to the trade would no doubt meet with a ready sale.

54. **Bread Nut** (*Artocarpus incisa*, var.)—Habitat, Pacific Pacific Islands. Season, November to February. The tree producing this Nut is a variety of the Bread Fruit. The so-called "Bread Nuts" are simply the seeds which are found in the interior of the large fruits that, in outward appearance, are indistinguishable from the ordinary Bread-fruits. The seeds are somewhat like chestnuts in look and flavour. They are boiled and eaten with salt, and are also used by cooks for stuffing poultry.

55. **Jack Fruit** (*Artocarpus integrifolia*).—Habitat, East Indies. Season, February to April. There are only a few trees growing in the island, and as the fruit is not cared for much by the people there are no signs of its propagation. The seeds are eaten like the Bread-nuts.

PALMEÆ.

56. **Coco-nut** (*Cocos nucifera*).—Habitat, Tropical Countries. Always in season. The Coco-nut, besides being exported in considerable quantities, enters largely into the food of the people of Dominica. The tree is very common, and there is scarcely a garden or yard in the island without one or more of these splendid palms growing therein. No particular use is made of the fibrous husk, so that this valuable article is really a waste product in Dominica. The oil is made in small quantities, and all of it is consumed locally. A "Cocal" or Coco-nut plantation near to the sea-shore, with machinery for making the oil and preparing the fibre and bristles from the husk, would no doubt be a very paying concern, and there is, therefore, room for capital and enterprise in this direction. If it pay to erect a factory in London to prepare the fibre and bristles, it ought to pay much the more in Dominica, where labour and land are cheap, where water power can

take the place of the more expensive steam-engine, and where there would be a saving in the difference between the carriage of the prepared and the raw products.

57. **Date** (*Phœnix dactylifera*).—Habitat, Africa and Asia. This fruit is rare in the island, but if a regular fruit trade were established it would doubtless be cultivated extensively. The Date palm grows very well in Dominica, and it appears to be quite hardy.

BROMELIACEÆ.

58. **Pine Apple** (*Ananas sativa*).—Habitat, West Indies. The fruit is in season from May to September, and it occurs in the greatest abundance. It is not exported to any extent, but that is simply because none of the planters have cared to "go in" for the cultivation under the present disadvantageous condition of the fruit trade. Within the last year or so, however, one of the most intelligent and enterprising of our planters has started the cultivation for the purpose of expressing the juice, which he ships to the United States at a profit. Pine Apple juice ought to be a success if introduced to the English markets during the hot season, for as a flavouring substance for ices, cooling drinks, and such like, it would be quickly bought up.

MUSACEÆ.

59, 60. **Banana** and **Plantain** (*Musa sapientum*).—Habitat, the Old and New World tropics. These fruits occur in the greatest abundance, and they are always in season. They could be exported from Dominica in practically unlimited quantities. Many varieties are grown in the island, and they are of all sizes and flavours, from the large and luscious Fig Banana to the small and delicate "Fig Sucrier." There is a very large trade in Bananas between Jamaica and the United States, and there is no reason whatever why a portion of this trade should not be diverted to Dominica. I believe that the fruit can be purchased cheaper in Dominica than in Jamaica, for the cacao cultivation is being rapidly extended in this island, and Plantain and Banana "trees" are put in for shade to the young Cacao plants. Thus there is always a quantity of fruit in excess of local wants, and only a fraction of this surplus is exported to the neighbouring colonies.

Besides the above sixty fruits several others have been introduced into the island lately, and they are growing so luxuriantly as to indicate that they have found in Dominica a congenial soil and climate. Amongst these fruits, I would especially mention the following which have been introduced from the Royal Gardens, Kew:

The Mangosteen (*Garcinia Mangostana*). Hab., East Indies.
The Baobab (*Adansonia digitata*). Hab., Tropical Africa.
The Durian (*Durio Zibethinus*). Hab., Ind. Archipelago.
The Monstera (*Monstera deliciosa*). Hab., Mexico.

All of the fruits enumerated in the above list could be produced in much greater quantities than they are now if there were such a demand for them that fairly remunerative prices could be offered to the growers. Of course many of the fruits could not be exported to Europe or even to North America under the present conditions of the trade. But were steam vessels, specially adapted to carry fruit and provided with cold storage chambers, to ply *regularly* between Dominica and New York and Dominica and London, all the fruits in the catalogue could be shipped in large and constantly increasing quantities.

In the development of a large fruit trade Dominica labours under peculiar disadvantages. The island is so backward that the means of communication from one part to another is of the worst possible description, and it thus happens that the fruit hitherto exported has been gathered from trees and plants growing only in the neighbourhood of Roseau and Portsmouth; the two ports of entry on the leeward side of the island. The other districts are practically untouched by the present trade, although fruit can be got from them in the greatest abundance. The roads, except for a mile or two round Riseau, the chief town, are simply bad bridle paths or goat tracks, and carriage by carts is entirely out of the question. Some years ago, with the view of opening up the coast trade, a few of the leading men in the island decided to get up a small company to start a coasting steamer. Most of the capital was readily subscribed as it was thought that the Government would guarantee an interest of 5 per cent., for the members of the Legislative Assembly and the Executive Council were all favourable to the scheme. But the Government in Antigua—which as regards facility of communication is as far away from Dominica as is Lisbon from Berlin—very injudiciously declined to sanction the small outlay for the first year or so, and the undertaking unhappily fell to the ground. The entire absence of proper means of communication from one district to another has much to do with the present backward condition of the island, and unless the country be opened up by good roads the fruit trade cannot possibly attain to anything like the large dimensions that the peculiar natural advantages of the country render it capable of reaching. But, notwithstanding this, the trade might be greatly increased even under the present adverse conditions, were the means of transit to the great markets improved, were greater care taken at the ports of destination to look after the interests of shippers, and were the Government to endeavour to foster the trade by offering subsidies to steamship companies willing to run regular fruit vessels, and by offering premiums to those planters and shippers who usually go into the trade in a serious manner. The Quebec Steamship Company do all they can to foster the trade, and they have really effected a good deal. But their ships are not specially adapted to carry fruit, and they do not arrive at the island with sufficient punctuality. In the case of Oranges it is necessary to commence the packing several days before the steamers are expected, and sometimes the vessels come into port a day or so late, in which case there is a heavy loss in the fruit. The Royal Mail Steam Packet Company do not, I believe, specially desire to develop a fruit trade with Dominica. But, still, all the fruit shipped from the island to London has hitherto gone by the Company's vessels, and it has been transhipped at Barbados, where the inter-colonial packets connect with the trans-atlantic ones. Oranges, Limes, and Shaddocks shipped in this way from Dominica have arrived in London after a fortnight's voyage in excellent condition, thereby showing, beyond all doubt, that the island can easily supply the home markets with Oranges and similar fruits. The trade with London might be immediately increased if Messrs. Scrutton, Sons, and Co., could be induced to make Dominica the last port of call for their direct line steamers; but, as this would probably dislocate their arrangements, they might require a subsidy for the first year or so, or until the trade became sufficiently extensive to bear a good margin of profit.

In the opening up, however, of a trade of this sort it is to be expected that there will be frequent losses if the fruit be consigned to the open market and sold for what it will fetch; and this is really one of the greatest obstacles in the development of the industry. Our growers and shippers of fruit are not men of capital, and, for this reason, a disastrous shipment may mean in individual instances the abandonment of further efforts in this direction. It requires for the building up of a a permanent trade that the nascent industry should be nursed by experienced persons. The Dominica fruit shipped to London should be received by a firm willing to take some trouble to obtain good prices for it, until wide channels for its disposal are regularly opened up. In large and rich countries where men of capital can be found ready to embark in such undertakings, all this would be done as a matter of course, but Dominica is too poor and too backward to be able to go about the starting of new industries in such a way as to be able to guarantee success. Experience has shown that the people of the island will not embark in a new undertaking unless it be satisfactorily demonstrated to them that there is money to be made in it. And really one cannot blame them. The crisis in the sugar trade, and the backward condition of the country, has rendered local men cautious to the extreme. It follows, therefore, that a rapid increase of the fruit trade of the island cannot be expected to take place unless aid comes from abroad.

Dominica is, as I have shown, peculiarly fitted by range of climate, fertility of soil, and geographical position, to become, for its size, one of the finest and richest fruit growing countries of the tropics. If these facts become known, men of capital in England and America may be induced to take the future of the fruit trade of the island into their own hands, and if this should happen it will be, I am satisfied, as fortunate for them as it will be for the future welfare of Dominica.

H. A. Alford Nicholls.

Mr. J. Cox Fillan, of Wall House Estate, has furnished the following information respecting the development of the fruit trade at Dominica:—

Under the head of the fruit trade of Dominica I confine myself principally to Oranges, as being the fruit in which the greatest trade is carried on, and in which I have most experience. Bananas, Pine Apples, and Limes are, to a limited extent, also exported from Dominica. There are several drawbacks to a successful development of the Orange trade. First, our fruit is sent too late to both the European and American markets, so that when it reaches those centres it has to compete with a larger quantity of Oranges than if placed there from May to August, instead of from September to December. This change of crop time could easily be effected if due regard were paid to pruning the trees at the proper time, and to other requisite modes of cultivation to obtain that end. Another drawback is the careless and almost wanton manner in which the fruit is picked, and the absence of any method in the selection or sorting of the various kinds of Oranges.

At present the majority of the Oranges sold in this market are bought by the shippers (who are not necessarily growers) from small proprietors and labourers, who have a few trees in or about their "gardens" (provision grounds) or cottages. These persons as a rule bestow no care on their trees, and are quite unconcerned whether their fruits are large or small, sour or sweet, stained or not; and if remonstrated with as to the small size of their fruit they will invariably reply in their native patois "the offspring of the same mother is not always alike and of the same size." I think the buyers and shippers of fruit could to a great extent induce the growers to remedy these drawbacks if they were to decline to buy inferior fruit, or to make such a difference between the prices of poor and of fine fruit, that the grower would find it entirely to his interest and to his profit to be careful in the gathering and selection of the fruit he brings to market. Yet another drawback is the unsuitableness of the steamers which now carry what fruit is shipped, and the irregularity and uncertainty of the delivery of the fruit at his destination. I suppose this desideratum is one that will remedy itself so soon as the "trade" becomes sufficiently large, but it is to be regretted that the present mode of conveyance does not give the shipper and the consumer all the advantages that could be derived by a speedy transport pending the increase of the trade.

The exportation of fresh preserved fruit is yet in its infancy, and I believe has hitherto been only tried experimentally. It now awaits only capital and energy and success will be achieved.

Jams, Jellies, and Preserves.—At present the sugar used in the manufacture of these has to be imported from England and from America, weighted with a heavy freight and a still heavier import duty, and before it reaches the markets another freight has to be incurred. It will thus be seen that West India preserves cannot in any way compete with the home-made sweets of England and the United States where sugar is cheaper than in its native land.

After all that has been written on fruit-growing, perhaps the most important step necessary to advance the economical industries of Dominica is the establishment of a botanical garden or station, under scientific and practical superintendence, where information and advice on agricultural subjects could be obtained, and economic plants supplied for sale at a moderate expense. Such an establishment, in my opinion, is absolutely indispensable, even at the cost of increased taxation.

J. Cox Fillan.

MONTSERRAT.

This small island has become the head-quarters of the Lime industry in the West Indies, chiefly through the enterprising action of the well-known Montserrat Lime Juice Company with which Mr. Joseph Sturge is connected. There were recently exported from Montserrat:—Lime juice of the value of 10,300*l*., Green Limes of the value of 325*l*., Tamarinds of the value of 254*l*., and general fruit of the value of 93*l*. The principal fruits enumerated by Mr. J. Spencer Hollings as growing at Montserrat are Java Almond (*Terminalia Catappa*), Avocado Pears, Banana, Bell Apple (*Passiflora maliformis*), Water Lemon (*P. laurifolia*), Citron, Cocoanut, Custard Apple, Date, Fig, Forbidden Fruit, Genip, Granadilla, Guava, Hog Plum, Jamaica Plum (*Spondias purpurea*), Java Plum (*Eugenia Jambolana*), Jack-fruit, Lemon, Lime, Mammea Sapote, Mango, Melon, Orange of several varities. Pineapple, Plantain, Pomegranate, Pomme Rose (*Eugeniu Jambos*), Sapodilla, Shaddock, Sour Sop, Star Apple, and the Tamarind. The Avocado Pear, Water Lemon, Bell Apple, Guava, Hog Plum, Lime, Mango, Mammee Sapote, Orange, Pineapple, Plantain, and the Shaddock are abundant. The Lime and Tamarinds are largely exported.

The months of June to December are the chief fruit months. At present there is so little demand that only Limes, Bananas, and Pineapples are grown for export. Of other fruits the quantities available are so small that no local wholesale price is obtainable.

Limes are exported fresh, preserved, or pickled. Lime juice is exported fresh and concentrated. Pine Apples are exported fresh and candied. Bananas are exported in a fresh state.

The production of fruit could be largely extended in Montserrat if regular opportunities for shipment in suitable vessels at a low rate of freight were provided.

The fruits now imported into the Colony are the ordinary bottled and pudding fruits from the United Kingdom, and the canned and dried products of the United States. The trade in these is very limited.

ST. CHRISTOPHER AND NEVIS.

In these islands most of the tropical fruits found in the West Indies are cultivated to a small extent. At present these fruits are utilised locally, and little if any are exported. The Banana, Pine Apple, Mango, Orange, Lime, Plantain, and the Mammee Apple are fairly abundant and easily capable of considerable extension. The Shaddock, Guava, Cocoa-nut, Granadilla, Pomegranate, are grown sparingly, and in the opinion of the Venerable Archdeacon Holme, to whom we are indebted for the above information, are not capable of being easily increased.

The preserved fruits available are Guava jelly, Guava jam, Pine Apple jam, Mammee Apple jam, Mango jam, and Tamarinds.

VIRGIN ISLANDS.

Mr. President Cameron has prepared the following information respecting the fruits of the Virgin Islands:

In compliance with the instructions contained in the Secretary of State's Circular Despatch of the 30th November 1887, I have the honour to forward such information as I am able to give relative to the fruits of this Presidency.

The only fruit that is at all cultivated is the Banana. Of these there are three kinds, the horse and fig Banana and the Plantain. Many other fruits grow wild, such as Mangoes, Guavas, Guava berries, Custard Apples, Avocado Pears, Sour Sops, and others. Bananas and Sour Sops are obtainable all the year round. Mangoes come in about the end of May, Pears in July, and Guavas and Guava berries a little later. The greater part of what is grown is available for export, and is actually exported. The production, however, is not on a scale to permit of wholesale dealings. All the fruits above-mentioned are exported in a fresh state, none in a preserved state. Their destination is St. Thomas. A fair quantity of the different kinds of Bananas are carried there, and realise from 40 to 75 cents a bunch. I am unable to give an estimate of the value of the various fruit exports; they can, however, only amount in all to an insignificant sum.

Bananas might, I imagine, be grown in very much larger quantities than at present, and the islands are fairly well situated for communication with the United States. The development of a fruit trade, however, is impossible without the introduction of capital, there being no local men with either means or energy to take up such a business whatever might be the inducement offered. Until, therefore, the Virgin Islands are redeemed from the utter isolation which renders them a *terra incognita* to all but the casual official, I fear that any resources they may possess either in this or any other line must remain undeveloped.

BERMUDA.

The following is a list of the chief fruits grown in the Bermudas:—

The Sugar Apple, common, and bearing freely; Cherimoya, becoming common; Lemon, common, but not produced in sufficient quantities for home consumption; Bitter Orange, common, bears freely; Sweet Orange, not common, many trees have ceased to bear at all, and the remainder are very irregular in so doing; Mandarin Orange, a few trees to be found; Grape Fruit, common, bears profusely; Grape, not common, most attempts to foster the growth having failed; Tamarind, not common, fruit not of much use; Strawberry, a fair amount raised for early home consumption; Quince, fairly common, but not fruiting satisfactorily; Surinam Cherry (*Eugenia uniflora*), common, and bearing freely; Guava, not very common, fruit unsatisfactory; Pomegranate, common, but fruit not of much use; Papaw (*Carica Papaya*), common, bears freely; Musk Melon and Water Melon, common, and bearing profusely in early summer; Avocado Pear, a most valuable and highly esteemed fruit, but bearing most irregularly, some years in profusion and others barely at all, obtains a high price, as much as 4*s*. to 6*s*. a dozen; Banana, common, bears profusely; Lime, common, bears freely, and is much used locally; Loquat, common, bears profusely.

These fruits are obtainable as follows:—

Fruit.	Season.	Local Prices.
Strawberry	January to May	2*s*. per quart.
Loquat	January to March	6*d*. „
Lemon	Perennial	1*s*. to 2*s*. per dozen.
Lime	Do.	9*d*. to 1*s*. 3*d*. per dozen.
Banana	Do.	2*s*. per lb. (by the bunch).
Sugar Apple	December to April	2*s*. per dozen.
Papaw	Perennial	1*s*. „
Musk Melon	July and August	1*d*. per lb.
Water Melon	Do. do.	1*d*. „
Bitter Orange	October to December	6*d*. per dozen.
Sweet Orange	Do. do.	1*s*. 6*d*. to 2*s*. 6*d*. per dozen.
Pomegranate	August to November	No trade.
Tamarind	August to December	
Guava	September to October	
Avocado Pear	July to October	4*s*. to 6*s*. per dozen.
Grape Fruit	October to December	No trade.
Cherimoya	Do. do.	6*s*. per dozen.
Surinam Cherry	Perennial	6*d*. per quart.
Quince	September to December	No trade.

None of these are available for export.

No fruits are exported at present; but Bananas (certainly), Avocado Pears, Loquats, Strawberries, and Melons (perhaps), might be produced more largely, but it is highly doubtful whether, under the general circumstances of the soil, the limited amount of cultivatable land, and the difficulties of transport, any remunerative cultivation for export could be carried on.

Oranges, Apples, Pears, Grapes, and Water Melons are largely imported from the United States, whence also quantities of tinned preserved fruits of all kinds are obtained. During the plying of the Jamaica-Bermuda subsidized mail steamers much tropical fruit arrived from the West Indies, but since the discontinuance of this service in 1886 the trade has entirely disappeared, and the want of the fresh fruit is much felt.

There is no doubt that almost every tropical, sub-tropical, or ordinary fruit will grow in these islands, whether remuneratively or not has never been ascertained. Many attempts have been made to induce the general cultivation of fruits, but without much result. The planter is engaged in the somewhat uncertain business of raising Onions, Potatoes, Tomatoes, and Beetroots for the New York market. At times he obtains very large and profitable returns for his labours, whilst at other times he experiences a heavy loss on his year's work, and it is very difficult to start new ideas with regard to gardening. Some progress has been made in Banana and Strawberry cultivation with satisfactory results, for there is a very fair demand for them during the winter and early spring seasons, when the islands are thronged by American and Canadian visitors. In many quarters it is believed, and it has been frequently urged by those interested in the commercial welfare of the community, that much larger profits would be obtainable if the planter and gardener were to give more attention to raising produce for the local market. Large quantities of very fine Peaches were formerly raised in these islands, but of late years, in fact since 1870, the fruit has been attacked when half grown by a highly destructive insect which causes it to drop from the trees, and a perfect specimen of the ripe fruit is rarely if ever seen here. The trees are still very numerous and grow luxuriantly, and it would be a great advantage if some remedy could be discovered to counteract and prevent the ravages of the insect.

LVIII.—INDIA-RUBBER IN UPPER BURMA.

The following "Particulars regarding the India-rubber Trade in the "Mogaung District of the Upper Burma Forest Circle," extracted from the monthly proceedings of the Chief Commissioner, Burma, for May 1888, have been communicated for publication in the *Bulletin* by the Secretary of State for India.

Mr. Warry, the author of the paper, is a member of the Chinese Consular Service who has been sent to Burma for work among the Chinese emigrants.

From W. Warry, Esq., Political Officer, Bhamo, to the Chief Secretary to the Chief Commissioner, Burma, Bhamo, 9th April 1888 :—

I have the honour to submit, for the information of the Chief Commissioner, some particulars regarding the India-rubber trade in the Mogaung district.

India-rubber seems to have been first exported from Upper Burma to Rangoon about the year 1870. Up to 1873 the trade was free to all who chose to engage in it ; since 1873 the forests have been worked under the monopoly system. For the first nine years five Chinese firms styled Mientsuan, Chengho, Fuhomei, Sunshenhsiang, and Paohsing, respectively, were the joint concessionaires. The two first named were Fokienese merchants who supplied the bulk of the capital, and the three last were Yunnanese who superintended the actual operations. The price received by the Burmese Government was Rs. 60,000 for the first triennial term (1873–75), Rs. 70,000 for the second (1876–78), and Rs. 90,000 for the third (1879–81). In 1882 there was a split between the members of the syndicate, the result of which was that the monopoly for that one year sold for Rs. 70,000. During the next year business in India-rubber was at a standstill owing to local disturbances caused by the "Kachin revolt." In 1884 two Yunnanese firms agreed to pay Rs. 45,000 for a three years' lease of the monopoly; and when their term expired, the lease for one year from September last was put up to auction and realised a lac of rupees.

The forest officer attached to the Mogaung column has no doubt reported on the general distribution of the *Ficus elastica* and on the Kachin methods of tapping it. I shall, therefore, touch very briefly upon these subjects. The Chinese say that the India-rubber tree occurs throughout a very extensive district stretching several hundred miles north of Mogaung and extending to the east far across the Chinese border. A fractional part only of this immense area has been worked. The largest and most regular supply of rubber seems to have been hitherto procured in forests distant from four to six days journey north of Kamein. An equally large supply should soon, it is said, be obtained from the Endaw and Laotsun districts. On the recent expedition we met a few raft loads coming down the Endaw River, but there has, as yet, been no arrangement between the Chinese and the local tsawbwas under which the forests can be systematically worked.

The Kachins are described as exceedingly jealous of interference with their trees, and very careful in their methods of tapping them. What I myself observed on the march fully bore out the latter part of this statement. The few trees seen were strong and vigorous, and though covered with innumerable small incisions even up to the tiny topmost branches, they had obviously not been drained to the extent of one-half their power. In the early days the Kachins made the natural mistake, soon discovered and rectified, of over-bleeding the trees; it was in this way ascertained that a large tree if bled to death would yield 500 viss of rubber in the course of a single season.

Mogaung is the headquarters of the India-rubber trade. Of the total yearly supply four-fifths are brought into Mogaung by Kachins, the majority of whom are in the regular employ of the Chinese lessees, and one-fifth is purchased in the districts by Chinese agents of the lessees. Under the present system the Chinese manager at Mogaung, a man named Li, makes liberal advances to Kachins to defray their expenses during the collecting season, which lasts from September till June. These advances are made almost indiscriminately to any one who applies for them, no security is asked or given, and it very rarely happens that this confidence in Kachin honesty is misplaced. The Kachins having brought the rubber into Mogaung sell it to Li. All payments are now made in rupees. The price obtained when I was at Mogaung averaged Rs. 145 for a 100 viss, last year it varied from Rs. 120 to Rs. 130. Formerly the Kachins used to be much cheated in the process of weighing, and they retaliated by passing off upon the purchasers India-rubber balls the centre of which consisted largely of stones and dirt. This system proving inconvenient to both parties was sometime since abandoned by mutual consent. The Kachin is now credited with the full weight or nearly the full weight of his rubber, which on its arrival at Mogaung is well washed, dried, and minutely examined, ball by ball, before it is sealed. Those Kachins who have received advances from Li, make the refund by selling to him at half the current price, until the amount of the debt is cleared off. A small quantity of rubber, as I have said, is collected by Chinese agents of the lessees. Up till quite recently there were only 10 or 12 of these agents. They travel from district to district making purchases from Kachins. The price paid is nominally the same as at Mogaung, but as the Kachins possess no standard weights they are usually cheated to the extent of about 70 per cent. This profit on the difference of weight more than pays all the expenses of the agents. In November of last year a new and hitherto unworked district was opened. Lin, one of the monopolists, arranged with an influential Chinese family named Chao (who reside at Tachiai and protect the Sima route into China), to hire some 400 Chinese and Shan coolies to work the forests in the neighbourhood of the Amber mines. Objection to this inroad was at once made by the local Kachin tsawbwas, who insisted on the right of working the forests themselves, and declined to admit other labour. After much discussion a compromise was arrived at on the following basis. Two hundred of the new coolies were to return at once, the remainder were to be allowed to collect rubber under the superintendence of the Kachins to whom they were to pay 10 per cent. of the quantity collected. The place of the 200 dismissed coolies was to be taken by an equal number of Kachins who were to be paid for what they collected at the rate current in other districts. Under this system matters have so far worked smoothly; it was expected at Mogaung that at least 20,000 viss of rubber would be obtained from the new forests this season.

In most cases India-rubber is subject to certain charges whilst in transit through Kachin districts other than those in which it was produced. The tsawbwas of such places usually take a very moderate toll, perhaps two or three balls out of each hundred. So long as these charges do not amount in all to more than 10 per cent. no complaint is made. But this proportion is sometimes largely exceeded; and in such cases a remonstrance, nearly always successful, is made by the Chinese to the tsawbwa or tsawbwas who have helped themselves too liberally. Posaw, the ex-Myoôk of Mogaung, was of great service to the Chinese in arranging disputes of this nature between them and the Kachins; since his flight a regular expenditure in presents to the tsawbwas has become necessary in order to keep the amount of transit dues at a reasonable level. Whatever may be the poll-tax paid on India-rubber coming down to Mogaung the Chinese manager and the Kachin owner bear the loss in equal shares. The Kachin, however, is amply compensated by being housed and fed at the expense of the Chinese during his stay in Mogaung.

The circumstances of the past year have been very favourable to the India-rubber trade. New producing districts have been opened, and old districts have been better worked than before. Owing to the apprehension caused by the visit of the British troops to the Jade country, little or no work was attempted at the mines till quite late in the season, and a number of Kachins and Shans usually employed at the mines were able to offer their services to the India-rubber traders, whose operations had at first been hampered by the scarcity of labour.

The profits realised this year by the lessees must be considerable. There are no means at Bhamo for ascertaining how much India-rubber they have already sent down to Rangoon, but it is thought here that before the end of their term they will have collected at any rate, if not hipped, something over 150,000 viss. I estimate that a total collection of only 50,000 viss would pay them a handsome dividend on their outlay. The account may be stated thus :—

PAYMENTS.	Rs.	RECEIPTS.	Rs.
Cost of license - - -	1,00,000	Sale of 50,000 viss at Rangoon, at Rs. 450 per 100 viss - -	2,25,000
Cost of 50,000 viss of rubber at Mogaung, at Rs. 145 per 100 viss - - -	72,500		
Freight, Mogaung to Bhamo (say) - - -	1,000		
Freight, Bhamo to Rangoon, at Rs. 6 8.0 per 100 viss -	3,250		
Expenses of establishment at Bhamo, Mogaung, and Mandalay (say) - -	12,000		
Incidental expenses, such as presents to Kachin tsawbwas, &c. - - -	2,000		
Total - - -	1,90,750	Total - - -	2,25,000

Which leaves a clear profit of Rs. 34,250, that is to say, over 17 per cent. on the capital invested, assuming that the whole outlay occurs at the commencement of the season, which is by no means the case. But there is little doubt that the lessees will collect a great deal more than 50,000 viss this season ; and on every extra 50,000 viss collected they will make a net profit of nearly a lac and a half of rupees.

From the foregoing calculation it seems clear that the public revenue derived from the India-rubber forests is far too small. It is not easy to indicate any sure plan by which it may be improved during the next year or two. It is possible, of course, that there may be keener competition when the monopoly is next put up to auction ; but it is quite as likely that a "ring" will be formed to keep the price at its present low level. The difficulty is that as matters now stand the Yunnanese are the only traders who can conduct business safely and profitably with the Kachins in the Mogaung district. With the single exception of Lœnpin, the Jade lessee, no native, even of another Chinese province, has yet attempted to compete with them in those regions. Indeed there are not half-a-dozen Cantonese or Fokienese, all told, at Mogaung, and these are all in partnership with natives of Yuannan, who require a larger capital then they can themselves command. The Yunnanese confess that not many even of their own traders possess the tact and patience essential to the preservation of continuous and satisfactory business relations with the Kachins. It is probable, therefore, judging from the present unfriendly attitude of the Kachins towards us that any attempt to buy rubber direct from them, or to collect it in their forests, would be a failure. The Yunnanese, from interested motives, would be averse to assisting us in the task, and without their co-operation, or at least their good will, it would be difficult, if not impossible, to secure a regular supply. With the complete pacification of the district this difficulty will no doubt disappear ; in the meantime it might be found possible, either by placing a reserve price on the monopoly when next put up to auction, or by abolishing the monopoly and taxing the India-rubber as it is brought down, or by effecting some arrangement with the Yunnanese traders, to make these fine forests yield something more than the nominal revenue heretofore derived from them.

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ROYAL GARDENS, KEW.

BULLETIN
OF
MISCELLANEOUS INFORMATION.

No. 22.] OCTOBER. [1888.

LIX.—COLONIAL FRUIT—(continued).

SIERRA LEONE.

The following is an extract from a despatch from Administrator Hay to the Secretary of State for the Colonies, dated 16th April 1888:—

"With respect to the information required as to the fruits produced in this Settlement, I referred the question to the authorities of the Local Botanic Society, and beg to transmit a copy of a report and returns prepared by its honorary secretary with the approval of the Society. I venture to remark that the report and returns are of an interesting character, and trust that the resources of the Settlement thereby may become more widely known."

Notes on the fruits of Sierra Leone, prepared by Mr. Samuel Lewis, Hon. Secretary of the Local Botanical Society:—

Freetown, April 15, 1887.

WITH reference to your letter of the 18th of December last, No. 1,079, in which you transmitted to the Local Botanical Society through me a copy of questions asked by Mr. D. Morris, Assistant Director of the Royal Botanic Gardens at Kew, relative to the fruits of the Settlement,

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I have the honour to state that the matter has been duly referred to the Society, which, with the object of securing a complete and accurate information on all points embraced by Mr. Morris's questions, had them published in the local press, and invited answers from any person who could give information.

* * * * * *

The chief fruits exported in a green state from Sierra Leone are pine-apples, bananas, plantains, pears, mangoes, limes, and oranges, of which pine-apples constitute the bulk of the exports to Great Britain and France. The quantity of the pines shipped to both countries may be approximately determined by the average export price, which is 10*d.* per dozen. At this rate, assuming that the 239*l.* appearing in the annexed returns for 1883 is not understated, it represents 68,792 pines as exported in that year alone. This quantity can be annually maintained and considerably increased if the trade were remunerative, and the large quantities which are produced in the Timneh country could be induced to flow abroad through the Settlement. But the loss sustained by the fruits arriving at their destination in bad condition has checked the continuity of the supply and growth of exports.

Almost the whole of the bananas, plantains, pears, mangoes, limes, and oranges grown in Sierra Leone, go to the Gambia, Goree and Senegal, whilst some pines also are exported to those places.

It will be seen from the table annexed that the principal, and indeed nearly all the fruits of Sierra Leone are in season from January to April, though some are obtainable throughout the year.

There is no export of preserved fruits, and the cocoa-nut is the only fruit of the Settlement exported in a dry state, and in that state, in which it takes the name of coprah, it is not used as fruit. But the waste of economic matter in the shape of shell, husk and fibre thrown away after separation of the kernel for coprah, and perhaps the reduction in the price of coprah during the past four or five years have stimulated the growth since last year of an export of cocoa-nuts in husk, chiefly to Europe, where the now neglected materials may be used in the manufacture of ropes and matting, and the kernel in its fresh state used as fruit.

Besides the suggestion just made relative to cocoa-nuts, it is not unworthy of record regarding the mango that its abundance and cheapness here, and the capacity which Sierra Leone has for its increased production, are conditions which point to the necessity for studying how and where it may be turned to account as an article of export, either green, to be used in the manufacture of spirits, which it is said may be profitably produced from it, or for consumption as fruit, or in a dried or preserved state. When in a fresh state, and before it is fully ripe, it is employed locally as, and is found to be a good substitute for, English apple-sauce.

Like pine-apples, the other exportable fruits above referred to may be produced in larger quantities than the present yield, but the drawbacks to their more extensive production, and to a greater investment in the fruit trade, are mainly, for the Gambia, Goree, and Senegal, countries almost destitute of fruits, the want of regular steam communication with them, and of precision in the dates of arrival and departure of the steam vessels now taking freight from Sierra Leone, and for Europe, the absence of quick transit, as well as the absence of vessels specially adapted for receiving and conveying fruit.

The export trade in two of the fruits of the Settlement is likely to gain a new impetus, viz., cashew and velvet tamarind; for the stone of the cashew is in great demand in Germany, where it is used in confectionery, and is sold there at 9*s*. a cwt., though it is only thrown into the dust heap here. Velvet tamarind (*Dialium guineense*) is being somewhat extensively used in pharmacy in France. The knowledge of the demand for these fruits in Europe is all that is necessary to infuse activity in their cultivation, and in their export hence.

The chief fruits imported into the Settlement are green apples from England and grapes from Madeira, whilst the preserved fruits consist of apples, apricots, blackberries, cherries, peaches, pears, plums, and strawberries from Germany viâ England, and olives from France.

The dried fruits imported are almonds, currants, figs, prunes, and raisins from France.

CHIEF FRUITS OF SIERRA LEONE.

Local Names.	In what Months obtainable.	Local Prices.
Pine-apple	Throughout the year, but abundantly from January to June.	10*d*. per doz.
Banana	Throughout the year	8*d*. a bunch.
Cashew	January to April.	—
Cocoa-nuts	Throughout the year	6*d*. per doz.
Cucumber	December to March.	—
Guava, red	September to December	About 2*s*. per bushel.
Guava, white	September to December.	—
Lime	Throughout the year, chiefly in August	6*d*. to 8*d*. per 100.
Locust	April to June.	—
Mango	Throughout the year, but chiefly February to June.	3*d*. per doz.
Orange	Throughout the year, but chiefly August to June.	—
Papaw	Throughout the year.	—
Pear	March to June	6*d*. to 9*d*. per doz.
Plantain	Throughout the year	3*d*. to 8*d*. per bunch.
Tamarind, black or velvet.	January to April.	—

GOLD COAST.

In a despatch dated 12th November 1887, addressed to the Secretary of State by Colonel White, it is stated that:—"Fruit, with the "exception of cocoa-nuts, cannot in my opinion at present be profitably "exported from the Gold Coast Colony, owing to its distance from all "markets and the want of speed of the steamers which call.

"A commission on the best means of developing the agricultural "resources of the Colony is now sitting, and I will refer the matter to "them. There is very little available knowledge of, or interest taken "in, such matters in the Colony, where officers are so constantly and "for the most part, strenuously employed, and the climate is so "enervating and sickly."

The following notes on the fruits of the Gold Coast have been prepared by the Reverend T. B. Freeman:—

Orange.—Native Fanti name *Akutu*. It grows in abundance in the Fanti districts and in the mountain regions of the interior behind Accra. The main harvest months are August and December. The culture could be greatly enlarged in a few years for shipment to England. The average market price is 3*d*. per dozen.

Pine-apple.—Fanti name *Abrobay*, Accra name *Brofongmey*. Grown in abundance all over the country. The culture could be greatly enlarged. The main harvest months are August and December, but they are largely produced all the year round. The pine is not only eaten as a fruit, but it makes excellent jam. The average market price is 1*d*. each.

Lime.—Fanti name *Ankama*, Accra name *Abonua*. Grown in great abundance. The culture could be vastly increased. The main harvest months are August and December. The average market value is about from 1*s*. to 1*s*. 6*d*. per bushel.

Guava.—Grows wild in moist situations all along the coast and for some miles inland, and bears abundantly, but it does not seem to be indigenous, as it has no native name. The harvest months are July and August and November and December. Local market value about 9*d*. per bushel. It makes excellent jam.

Ground Nut.—Fanti name *Inkatsi*, Accra name, *Inkatia*. This is a fruit of considerable commercial importance, and was largely cultivated for the European market 20 or 30 years ago for the extraction of its oil, and for other purposes. The harvest months are October and November. It could be grown to any extent in the plains near the coast. Market value, about 3*d*. per lb.

Custard Apple, Sour Sop, and *Sweet Sop.*—These three are cultivated for private use, but they have no commercial value. Accra name, *Alugun Tongone*.

Papaw.—Fanti name, *Brofiri*, Accra name, *Appapa*. This is cultivated extensively throughout the country, and used generally as a fruit, but in an unripe state it is used on the tables of European residents as a vegetable. It bears fruit all the year round. Average market value, about 1*d*. each.

Pumpkin.—Fanti name, *Effiri*, Accra name, *Sacraibuntey*. Grows abundantly in all parts of the country. It is of good flavour, can be used either as a fruit or vegetable, and would, under certain conditions, bear shipment to Europe. The harvest months are August and December. Average market value, 3*d*. each.

Plantain.—Fanti, *Boradzi*, Accra, *Amada* and *Banana.*—Fanti, *Kwadu*, Accra, *Aquadoo*. These are largely cultivated, and bear all the year round. They have no commercial value here as fruits.

LAGOS.

The following is an extract from a despatch from Mr. F. Evans, C.M.G., Acting Administrator of Lagos, to the Secretary of State, dated 27th May, 1887:—

"I have the honour to transmit to you the only information I have been able to gather concerning the fruits of the Colony, and, meagre as this is, I would ask you to believe that the difficulty experienced in its collection is the sole cause of the delay which has occurred in replying to the circular despatch.

"There is not sufficient fruit of any kind grown in or near Lagos to enable exportation, for trade purposes, to take place, and what is grown is mostly of an inferior quality, no attention being paid to its cultivation, and although limes, sweet oranges and tamarinds might possibly be extensively cultivated and preserved for exportation, the length of the voyage between here and Europe precludes the possibility of the shipment of fresh fruit."

The names of the common fruits of Lagos are:—Banana and Plantain, Pine-apple, Mango, Cashew, Orange and Lime, Bread-fruit, Pomegranate, Sour Sop, Custard Apple, Avocado Pear, Tamarind, Granadilla, Papaw, Water Melon.

With the exception of the Mango and Cashew, the above fruits are obtainable throughout the year. They are not suitable for exportation in a fresh state, and there are no wholesale prices for quotation.

Fruits grown in the Colony are exported either in a fresh or preserved state.

Fruits grown in the Colony are capable of being produced in much larger quantities, but the natives do not understand the cultivation or the method of preserving, and consequently there is no inducement among the local traders to open up or extend a trade in fresh or preserved fruits.

NATAL.

The information respecting the fruits of Natal, supplied by the Government of the Colony, has been prepared by Mr. J. Medley Wood, A.L.S., Curator of the Durban Botanical Gardens; by Dr. P. C. Sutherland, and by Mr. J. T. Edwards, a nurseryman and Member of the Committee of the Pietermaritzburg Botanic Society.

Mr. Medley Wood's Report deals chiefly with the fruits grown in the coast districts of the Colony:—

Botanic Gardens, Durban, July 7th, 1887.

I BEG to enclose, according to your request, a list of the chief fruits grown in the coast districts of the Colony, with the months in which they are obtainable. I have so very little acquaintance with the uplands or the fruits that are grown there that I can deal with the coast districts only.

As to the quantities available for export, I am quite unable to give reliable information, and can only say that at present, at any rate, the quantity produced is not by any means large, but may be very materially increased if the industry be found to be remunerative.

At present oranges, naatjes, bananas, and pine-apples are exported in a fresh state, chiefly to Cape Colony, Free State, and Transvaal, and in smaller quantities to Europe; but as this is purely a commercial matter, I do not feel myself in a position to give information of any value upon it.

The whole of the fruits enumerated in the annexed list are capable of being produced in very much larger quantities than at present, if growers can only be assured of a remunerative market for their produce.

All that (in my opinion) is necessary to develop a fruit trade from the Colony is certainty of a market; facilities for transport, such as cool chambers on board the steamers, &c.; knowledge of the best mode of packing, and care on the part of the steamship companies to prevent such enormous losses from pilfering in transit as was experienced in the trial shipment sent home by the Commissioners of the late Colonial and Indian Exhibition.

The careful culture of fruit has not as yet received much attention in the Colony, but if the industry were found to be fairly remunerative, I have no doubt whatever that the size and quality of the fruit grown would soon be materially improved.

So far as I am aware, the only fruits imported into the Colony in a fresh state are grapes from the Cape Colony; as to the quantity imported, I have no means of obtaining information.

The importation of preserved fruits is a matter about which I know nothing.

I may say, in conclusion, that with a view of doing something to encourage the growth of fruit in the Colony, we have imported plants of the best kinds of mango and shaddock from India, and orange, naatje, and lemon from Florida, and I am expecting also grafted plants of the best kinds of guavas from India, and we shall at all times be willing to procure seeds or plants of any kind of fruit which it may be thought desirable to introduce into the Colony.

LIST of the CHIEF FRUITS GROWN on the COAST LANDS of NATAL.

Popular Name.	Scientific Name.	When in Season.	Remarks.
Orange	*Citrus Aurantium*	May to December	Plentiful.
Naatje	„ *nobilis*	„ „	„
Mandarin Orange	„ „ var.	„ „	„
Lemon	„ *Medica* var. *Limonium.*	„ „	„
Shaddock	„ *decumana*	„ „	Scarce.
Seville Orange	„ *Aurantium*	„ „	„
Lime	„ *Medica* var. *acida*	„ „	„
Banana	*Musa sapientum*	October to July	Plentiful.
Pine Apple	*Ananas sativa*	December to March	„
Grape	*Vitis vinifera*	February	Scarce.
Catawba Grape	„ „	„	„
Amatungulu	*Carissa grandiflora*	January to May	Plentiful.
Guava	*Psidium Guava*	April to July	„
China Guava	„ *pyriferum*	„ „	„
Mountain Guava	„ *Cattleianum*	„ „	Scarce.
Peach	*Amygdalus persica*	December to February	Plentiful.
Mango	*Mangifera indica*	„ March	„
Cape Gooseberry	*Physalis pubescens*	June and July	„
Loquat	*Eriobotrya japonica*	July to September	„
Grenadilla	*Passiflora edulis*	November to May	„
Brazil Cherry	*Eugenia brasiliensis.*		
Papaw	*Carica Papaya*	October to May	„
Avacado Pear	*Persea gratissima*		Scarce.
Strawberry	*Fragaria vesca*	November and December	„
Raspberry	*Rubus Idæus*	„ „	„
Mulberry	*Morus sp.*	„ „	Plentiful.
Litchi	*Nephelium litchi*	„ „	Scarce.
Sweet Sop	*Anona squamosa*	—	„
Custard Apple	„ *reticulata*	—	„

J. MEDLEY WOOD.

Dr. Sutherland's Report is as follows :—

9th July 1887.

Referring to your communication enclosing copy of a letter dated the 14th August 1886 from the Royal Gardens, Kew, together with a series of questions touching the fruit products of this colony, I have the honour to subjoin all the information I have been able to collect.

The chief fruits grown in the colony, in order of their importance, are :—

1. Pine-apple (*Ananas sativa*).
2. Banana (*Musa sapientum*).
3. Plantain (*Musa sapientum*).
4. Orange (*Citrus aurantium*), in great variety.
5. Naatje (*Citrus nobilis*).
6. Lime (*Citrus Medica* var. *acida*).
7. Lemon (*Citrus Medica* var. *Limonum*).
8. Shaddock (*Citrus decumana*).
9. Citron (*Citrus Medica*).
10. Peach (*Amygdalus persica*), in variety.
11. Apple (*Pyrus malus*), in great variety.
12. Quince (*Cydonia vulgaris*).
13. Apricot (*Prunus armeniaca*).
14. Fig (*Ficus Carica*).
15. Pear (*Pyrus communis*).
16. Grenadilla (*Passiflora edulis*).
17. Loquat (*Eriobotrya japonica*).
18. Grape (*Vitis vinifera*), Cape varieties and Catawba.
19. Strawberry (*Fragaria vesca*).
20. Cape gooseberry (*Physalis pubescens*).
21. Amatungulu (*Carissa grandiflora*).
22. Tamarind (*Tamarindus indica*).
23. Mango (*Mangifera indica*).
24. Avocada pear (*Persea gratissima*).

Pine-apples, generally a coast product, but grown up to 2,500 feet in sheltered localities, are available from January to August—in exceptional cases, the whole year. Supply equal to any demand. Prices 1*d.* to 3*d.* each, according to season and quality.

Bananas and *plantains* produced on the coast, and up to elevations of 1,500 feet are available generally throughout the whole year. If there were a demand the supply would be unlimited. Prices vary from one to two shillings a bunch, according to size and quality.

Oranges, limes, &c. are available from April to August. Grown all over the Colony the supply would meet any reasonable demand. The prices vary according to seasons, being lowest between May and August, and highest during the scarcity. Immense quantities are lost annually for want of a market. Marmalade and lime-juice may be prepared in unlimited quantity. This industry is extending rapidly, and will soon be sensibly realised.

Peaches are universally grown all over the Colony, certain varieties being adapted for the warmer coast districts, and others of the hardier and better-flavoured varieties more suitable for the colder and more elevated districts. They are available from December to February. The supply is far in excess of the demand, and can be pushed to any extent if there were a market. Fully three-fourths of the crop is annually lost from want of a market and the perishable nature of the fruit. Much is preserved for local use. A price, under the circumstances, can hardly be given. When the fruit is offered for sale it is merely to cover cost of gathering and carriage to market.

Apples, like peaches, are grown all over the Colony, the hardier varieties being in the upper districts. The supply is far in excess of the demand, there being no market for the produce of every farm and garden. The fruit is in season from December to January, and prices are such as cover cost of gathering and carriage to market, 1*s.* 6*d.* to 3*s.* a hundred, according to size and quality.

Quinces, like apples, thrive best in the upper districts of the Colony. They are in season in January, earlier or later according to situation; cultivation capable of extension unlimitedly if there were a market. The fruit is often preserved but seldom sold, there being no demand.

Apricots come into season in November. Any demand could be met by large supplies. The price, 2*s.* and 3*s.* per 100 for first supplies, soon falls owing to the limited market.

Figs are ready in January, and continue in season for two or three months. Production may be extended indefinitely. Prices just sufficient to cover cost of gathering and carriage to market.

Pears are in season in February and can be produced to any extent. Prices when sold merely nominal.

Grenadillas are in season from November to May. Its growth is capable of indefinite extension. Prices vary according to season, 1*s.* 6*d.* a bushel being a common quotation, and insufficient to cover cost of gathering and carriage.

Loquats are in season in May; capable of extension indefinitely; prices nominal, merely sufficient to cover cost of carriage.

Grapes come into season in December, and continue for two or three months. The price varies from 6*d.* to 1*s.* per lb., according to variety, quality, and season, the Cape varieties being the most expensive. The Catawba, owing to general hardiness and freedom from disease, is capable of extension without limit. A valuable preserve is being made from this grape which threatens to take the place of black currant jelly.

Strawberry.—This valuable fruit is coming into general cultivation, and may be extended on any scale. It is in season from December to April. Prices vary according to season, 6*d.* a pint being the minimum.

Cape gooseberry.—This valuable esculent is not cultivated, being permitted to occupy fences and fallow lands in native use. It might be taken into cultivation, and by this means could be extended. The natives enjoy the entire trade, collecting the fruit in their own way and at their convenience, selling it to Europeans in town or country. The price is generally about 4*s.* 6*d.* a bushel. According to situation as to coast or upper districts, the fruit is in season from February to May. This fruit is made into a jam, which is hardly ever known to ferment.

Amatungulu.—This is entirely a coast plant, and the fruit is in season from January to May. As a rule the plant has not been cultivated, but it admits of ready extension by cultivation, and thereby its productiveness is greatly increased. The natives collect the fruit from the plants in their wild state, and dispose of it to Europeans; the price, therefore, varies from a mere nominal sum to anything they can get.

Tamarind.—This has been tried, but on a limited scale. The fruit ripens in May, but there is scarce any demand for it.

Mangoes can be grown in abundance, and come into season in May, but there is no demand for them.

Avocada pear can also be grown in abundance, and comes into season in March, but there is no demand for the fruit.

In 1886 the dried and preserved fruits exported were entered of the value of 422*l.*, but the sorts are not enumerated. The green fruit exported, chiefly Bananas, were entered of the value of 2,439*l.* Both kinds, viz., the preserved fruits and the green or fresh, were shipped to the Cape Colony.

All the above-mentioned fruits are capable of being produced in much larger quantities. The absence of a market has deterred the farming community from pursuing this industry beyond their own special and local requirements. The steps, in my estimation, necessary to develop a fruit trade are first the preservation of the fruit either by judiciously drying it or by preserving it in tins. Messrs. Jameson and Co., Durban; Hulett, Nonoti; Ladds, Mooi River; and Blaker, Estcourt, have made a good start in that direction, and others will follow their example. Local men complain that the tariffs of neighbouring states militate seriously against the use therein of Natal preserved or green fruits, import duty being so high as to prove prohibitive. This, no doubt, is the case (as the question would be viewed in the light of free trade) omitting the consideration of the question whether the industries of these states do not stand in need of some such protection as is secured by a high import duty. The trade with the mother country is sericusly menaced by the long ocean voyage, and the risks of damage to green fruit, however well it may be prepared before embarkation. In the case of preserved fruits, the new industry here will have to cope with the same industry established in other colonies and states for many years enjoying a reputation which cannot easily be set aside.

Dried fruits, unspecified, imported from the United Kingdom, 80,000 lbs.; value 1,252*l.* From Bombay, Calcutta, and Madras, 195,867 lbs.; value 612*l.* Mozambique, 608 lbs.; value 8*l.* America, United States, 850 lbs.; value 14*l.* Currants and raisins from the United Kingdom, 183,828 lbs.; value 2,541*l.* From Cape Colony, 34,548 lbs.; value 346*l.* Preserved fruit from United Kingdom, unspecified. 26,378 lbs.; value 653*l.* Calcutta, 180 lbs.; value not specified. Cape Colony, 38 lbs.; value 8*l.* Fresh fruit:—Cape Colony, quantity not specified, value 180*l.* Mauritius, quantity not specified, value 10*l.* The total of imported fruit, preserved, dried, and fresh, is nearly 6,000*l.* per annum, while the exports are not quite half that sum.

In certain conditions of the weather favourable to the development of insect life, fruit is liable to suffer much, the only remedy for which is the maintenance of the trees in the most vigorous possible condition, giving proper heed to the due supply of manure and moisture. Violent hailstorms occasionally do much damage, but as they are very local it rarely happens that a district suffers; of two plantations a quarter of a mile apart, one may escape entirely, while the other may have been entirely denuded of its fruit.

Regarding the institution of a fruit trade with the mother country, or with the neighbouring states, it appears to me that the first object should be to remove the necessity there is for importing fruit in a preserved state or dried. As I have already observed, steps have been taken towards this end. When imports cease, no doubt there will be a surplus of preserved and dried fruit which may with perfect safety be placed upon the markets at home, or in other colonies or states where there may be a demand for the same. Much experience and unwearied care are necessary in the conduct of the export of fresh fruit. Facilities of shipment are, it is true, so great now as to lessen the time the fruit requires to be at sea considerably below the period required fifty years ago for the passage from the Mediterranean or the Azores. It should, however, not be forgotten that the latter slow passage was made by a sailing vessel in a cold season of a temperate climate, while the modern quick passage is made through the tropics in a steamer of great heat. Preserved and dried fruits suffer comparatively little from such heat as would be totally destructive to fresh fruit. Much no doubt may be done by careful packing and the maintenance of the lowest temperature circumstances may permit; but these conditions may involve expenses that will exceed the value of the fruit when exposed for sale in the home markets.

P. C. SUTHERLAND.

The following Report has been prepared by Mr. J. T. Edwards relative to the cultivation and production of fruit in Natal:—

Pietermaritzburg, 20th January, 1888.

IN accordance with the request of his Excellency the Governor, I have the honour of furnishing you with the following particulars respecting the cultivation of fruit in this Colony:—

The fruit-bearing area in Natal may be divided into three districts, viz., Coastland, Midland, and Upland; these districts being defined by the varying altitude.

The Coast district embraces a belt of country extending on an average from 20 to 30 miles inland. In this district nearly all the known tropical and semi-tropical fruits thrive. Those at present most extensively cultivated are the pine-apple, banana, orange, mango, and guava. Fresh fruit of the two former are exported largely to the Cape Colony ports, also in smaller quantities to the Transvaal gold fields and to the Orange Free State. There are two varieties of the pine-apple grown, viz., the Jamaica (spiny-leaved) and the smooth-leaved Cayenne. Both varieties do well, but the fruit of the latter is especially fine, weighing in many instances from 4 lb. to 6 lb. each. The wholesale price of the spiny-leaved kind is from 3*d*. to 6*d*. per dozen, and of the smooth-leaved from 3*d*. to 1*s*. each. Although considerable quantities of these fruits, both in a fresh and preserved state, are exported annually, the growth at present is greatly in excess of the demand. All the varieties of the orange do well, and during late years the plantations have been greatly increased. The yield of fruit is enormous, some trees bearing no less than 4,000 oranges. The variety most esteemed for its fine flavour and extraordinary fruitfulness is the naatje, or mandarin orange. The wholesale price of the orange is from 6*d*. to 1*s*. 6*d*. per 100, and of the naatje from 1*s*. to 2*s*. per 100. The Coast oranges are in season from May until September. Of the other fruits which thrive in this district may be enumerated the lime, shaddock, lemon, papaw, loquat, grenadilla, Brazillian cherry, Avocada pear, mulberry, pomegranate, litchi, sweet sop, custard apple, &c. Also the Cape gooseberry, and amatungulu, two indigenous fruits which, when preserved either as jam or bottled fresh, are much valued.

The Midland district is situated at about 2,000 to 3,000 feet above sea level, and the principal fruits grown are the apricot, peach, pear, apple, and orange, and of small fruits, the strawberry. The apricot and peach are grown extensively throughout the district, and the yield of fruit is most prolific. The local markets are much too small for the consumption of this fruit, and many tons are annually allowed to waste or are fed to pigs. The leading varieties of the apricot grown in the Colony are the Large Early, Moorpark, and Turkey. The varieties ripen in the order named; the Large Early about the first week in December, and the Turkey early in January. The wholesale price for apricots this season has been from 3*d*. to 6*d*. per 100. The varieties of peaches grown are very numerous, but those most in favour are the Alexander, Barrington, Grosse Mignon, Precoce, Royal George, Noblesse, Early

White, and Walker's Large Yellow. The white varieties of the peach ripen in December, the red varieties in January, and the Yellow ones early in February. Nectarines do fairly well, but are not grown so extensively as the peach. The best varieties are Stamwick, Elruge, Newington Early, and Pitmaston Orange. The wholesale price for peaches is from *3d.* to *1s.* per 100, according to quality, and of nectarines, *2s.* to *3s.* per 100. Pears have not been planted very extensively until within the last six or seven years. They do well throughout this and the Upland district, the trees coming into profitable bearing from 8 to 10 years old, or in about half the time required for their maturation in Great Britain. The following varieties are amongst the best yet grown in the Colony, viz., Cape Saffron, Burgamot, Jargonelle, Beurre Diel, Louise Bon de Jersey, Bon Chretian, Beurre de Aumanlis, &c. Pears are in season from January until March. Several shipments of this fruit despatched last January arrived in London in good order, and it is to be hoped that an increased and remunerative trade may be done with the home market. The wholesale price of pears is from *1s. 6d.* to *5s.* per 100. Apples are grown largely in this district, but the finest fruit comes from the Uplands. Considerable disappointment has been experienced in the Midlands on account of the susceptibility of some varieties to the attack of the American blight (*Schizoneura lanigera*), this pest having caused much damage to many orchards. Much experience has, however, been gained, with the result that greater care is now taken in the selection of blight-resisting varieties, also in the use of healthier stocks for the propagation of young trees, than was the practice formerly. The following are the most approved varieties: American Lady, Blenheim Orange, Bedfordshire Foundling, Beauty of Kent, Dutch Tulis, Pistorius' Seedling, Stermer Pippin, Red Quarrendon, Yorkshire Greening, and Royal Pearmain. Apples are in season from January until March. The wholesale price is from *6d.* to *1s. 6d.* per 100. Vines do fairly well, but the choice varieties require protection from the rain during the ripening season. An American variety, known here as the Catawba, thrives most luxuriantly, and produces enormous crops of fruit without the aid of the slighest shelter. A very agreeable wine is being manufactured from the fruit, the production of which can be increased to any extent. The market value of this grape is from *1d.* to *2d.* per lb. The Colony is indebted to Sir Theophilus Shepstone for the introduction of this valuable plant. Figs do well in the neighbourhood of Maritzburg, and if attention were given to the drying of this fruit a valuable increase might be made to our exports. The orange and naatje do well, and as the time of ripening is somewhat later than the coast, the supply from this colony might extend from May until November. Strawberries grow with perfect luxuriance, and produce their fruit from September until March. The principal other fruits grown in this district are almonds, loquats, marabella plum, guavas, mulberries, quince, lemons, limes, pomegranate, medlar, walnut, Spanish chestnut, raspberries, &c.

The Upland district is from 4,000 to 5,000 feet above the sea level. Here all the hardy European and other fruits thrive, including the gooseberry, currant, cherry, greengage, and other plums, damson, &c.

It will be seen from the foregoing remarks, and from the list appended hereto, that the fruit-growing capabilities of the colony are very great, and that the production of tropical, semi-tropical, and hardy fruits could be developed to an almost unlimited extent. The local markets, however, are already too small for the supply, and it is of the utmost importance that markets outside the colony should be secured for the sale of our surplus fruit. The trade in preserved fruits, with the rapidly increasing English population in the Transvaal, is being seriously retarded by the 40 per cent. duties imposed by our Dutch neighbours.

To enable us to open up a successful trade with the mother country every effort should be made to induce the steamship companies to provide refrigerators in their ships, and to fit up suitable compartments for the storage of fruit during the lengthy voyage to England ; but perhaps the most important matter is to urge a reduction of the high freight charges, which at present are quite prohibitive in their effect. With these improvements effected it is reasonable to anticipate that a large trade might be done with the home markets in fresh fruit of the orange, naatje, pine-apple, pear, mango, banana, &c.

Although difficulties may attend the exportation of fresh fruit, these disadvantages cannot affect the development of an export trade in preserved and dried fruits. Considerable attention has been devoted to this trade during the past few years, and the dried fruits prepared by Messrs. Blaker & Cautherley, of Estcourt, are equal, if not superior, to the best imported samples. The same remarks also apply to the excellent jams, jellies, marmalades, candied and bottled fruits manufactured by Messrs. Jameson & Co., Durban, Mr. Ladds, Mooi River, and Mr. Procter of Maritzburg.

In regard to the imports of fruit into the colony, these are mostly preserved fruits, jams, &c., and come almost exclusively from Great Britain, excepting dried fruits, which are imported from America. It is, however, satisfactory to note that the consumption of imported jams in the colony is rapidly decreasing, on account of the superior quality of the colonial manufacture, and from the fact that the prices of both articles are in most cases about equal. The recent increase in the duty imposed on imported jams and other preserved fruits may cause a slight decrease in the revenue, but I venture to say that this will be made up for by the increase on tin and other articles used in the preserving business ; and it ought also to be remembered that by the encouragement of this industry a market is created for our sugar.

LIST of the CHIEF FRUITS GROWN in the COLONY of NATAL.

Popular Name.	When in Season.	Wholesale Price.	Quantity.
Apricot	December and January	3*d.* to 6*d.* per 100	Very plentiful.
Avocada Pear	February	—	Scarce.
Apple, 40 varieties	January to March	6d. to 1*s.* 6*d.* per 100	Very plentiful.
Almond	March	—	Scarce.
Amatungulu	January to May	1*d.* to 1½*d.* per lb.	Plentiful.
Brambles	December to February	—	—
Brazilian Cherry	—	—	—
Banana	October to July	1*s.* per 100	Plentiful.
Citron	May to January	3*s.* 6*d.* per 100	Scarce.
Cherries, 6 vars.	January	—	„
Currants	December	—	„
Custard Apple	—	—	„
Cape Gooseberry	May to August	½*d.* to 1*d.* per lb.	Plentiful.

Popular Name.	When in Season.	Wholesale Price.	Quantity.
Catawba Grape	January to March	1*d.* to 2*d.* per lb.	Very plentiful.
China Guava	April to August	1*d.* to 3*d.* „	Plentiful.
Date	—	—	—
Dingaan Apricot	November to January	½*d.* to 1*d.* per lb.	Plentiful.
Fig	„ „	—	„
Guava (large)	April to August	1*d.* per lb.	„
Gooseberries	November and December	—	Scarce.
Grenadilla	November to May	6*d.* per 100	Plentiful.
Grapes	January to April	3*d.* to 9*d.* per lb.	—
Lemon	May to January	6*d.* to 1*s.* per 100	Plentiful.
Lime	„ „	2*s.* to 3*s.* „	—
Loquat	July to September	½*d.* to 1*d.* per lb.	Very plentiful.
Litchi	November and December	—	Scarce.
Melons	November to May	—	—
Medlar	April to May	—	Scarce.
Mulberry	September and October	½*d.* per lb.	Very plentiful.
Mango	December to March	3*d.* to 6*d.* per doz.	Plentiful.
Marabella Plum	October	3*d.* to 6*d.* per lb.	„
Mandarin Orange	May to December	1*s.* to 2*s.* per 100	Very plentiful.
Naatjes	„ „	„ „	„ „
Nectarine	December and January	2*s.* to 3*s.* per 100	—
Orange	May to December	6*d.* to 1*s.* 6*d.* per 100	Very plentiful.
Pine-apple	December to March	3*d.* to 6*d.* per doz.	„ „
Papaw	October to May	—	Plentiful.
Pomegranate	March and April	—	„
Plantain	October to July	9*d.* per 100	„
Plum	January	—	Scarce.
Peach	December to February	3*d.* to 1*s.* per 100	Very plentiful.
Pear	January to March	1*s.* 6*d.* to 5*s.* per 100	„ „
Quince	„ „	1*s.* 6*d.* per 100	„ „
Raspberry	November to January	3*d.* per lb.	—
Rose Apple	—	—	—
Strawberry	September to April	3*d.* per lb.	Plentiful.
Shaddock	May to December	—	—
Sweet Sop	—	—	—
Seville Orange	May to December	—	Scarce.
Walnut	February to April	—	—

JOHN T. EDWARDS.

Pietermaritzburg, 20th January, 1888.

MALTA.

The inquiry into the fruits of Malta was entrusted by the Government to a special board. For this board the following exhaustive Report has been prepared by Professor Gavino Gulia, M.D., Director of the Botanic Gardens:—

The Maltese islands have been from time immemorial celebrated for their fertility. The spikes of corn on ancient Maltese coins denote the fecundity of Malta, the agricultural produce of which has often been praised by Roman writers. Rich and very productive plantations which covered this country were destroyed by the Saracens who took possession of these islands (A.D. 870–1090). It was in the 15th century that our countrymen began to repair the great damage thus caused by these enemies of Christendom and civilization. Unluckily, afterwards the cultivation of cotton and wheat, and in modern times, that of potatoes, which to our husbandmen seemed more profitable, was the cause of their putting aside the planting of trees. The extensive plantations were no more cared for, the trees were felled for timber to make room for other economical products,—a fact which is greatly to be regretted, for, owing to its excellent climate and fertile soil, trees and shrubs of different kind grow in Malta wonderfully and produce fruit, which being of an exquisite sort, would well repay exportation. It is desirable that the Agrarian Society of Malta and the wealthy proprietors of lands should do their utmost to have these islands once more covered with productive plantations, giving preference to the olive, the almond, the vine, and orange trees.

The long felt need of water supply in rural districts has lately, fortunately, been a subject of careful research. The water supply of these islands is derived from rainfall, part of which is directly absorbed by plants, part is re-evaporated, part runs into the sea through numerous ravines, and part sinks into the soil and occupies natural reservoirs, or runs between the strata that form the geological structure of the Maltese group. By digging deep wells a considerable amount of water has already been obtained. By the laws lately enacted our ground tillers will no more depend simply on the rainfall, as a reasonable supply of water will be pretty equally distributed to all parts of the island. In a place like Malta, subject to droughts from periodical want of rain, tanks are indispensable to the agriculturist; it would therefore be advisable to force, by law, landlords to dig a tank in each field, the dimensions of which to be proportionate to the extension of the field itself. With the view of encouraging agriculture, prizes for the best plantations should be awarded to farmers; and whilst an easy way of obtaining young trees is afforded them, the expense of obtaining water for irrigation should be as moderate as possible.

The art of manuring is very little understood by our farmer, who chiefly uses rotten animal and vegetable manures after having exhaled their best constituent parts whilst lying in a corner of his field. He knows nothing of liquid manure, "which" as Professor Lindley remarks, "works the wonder, and operates like the overflow of the Nile or the "Indus." The large quantity of nightsoil, which is now lost in the sea, would become a most valuable manure to our gardeners were they taught how to employ it properly. Owing to the unchanging habits of our country-people, the Maltese farmer does not differ greatly from his ancestors. Very little, if any, novelty has been introduced into the old farming customs of Malta. Owing to the want of sound knowledge of horticulture and of proper agricultural implements, the work of our farmers is laborious, tedious, expensive, and often unsuccessful. As a modern writer remarks, "farming in Malta and "Gozo is a battle and victory of labour. The 144 square miles "comprised within the insular area are partly barren rock, and in "many respects a geographical riddle. Cultivation has asserted its "sway over 54,716 acres, the remainder being sterile rocks." It is to be hoped that a large portion of the waste open spaces some day or other will be brought under cultivation, that the primitive implements of agriculture still in use will be superseded by proper machinery suitable for our soil, and that, as books for our farmers are useless, lectures on horticulture will be given them in each casal, with the view of teaching them how to improve their old methods of cultivation and lead them to the discovery of better modes. It would be then possible to introduce and largely cultivate many exotic trees and shrubs, bearing excellent fruit both for the home market and for exportation; and to improve at the same time the products of those species which are now more or less successfully grown.

Wild Fruits.

Under this term we include the *Rubus discolor*, or common bramble called *gholliek* by the Maltese, plentiful both in Malta and Gozo. The small acid drupes are grateful to most palates. Our ancestors used to make of them jams, tarts, and a syrup which, being sub-acid and cooling, was recommended to allay the heat and thirst of patients suffering from fever. The fig tree *Ficus Carica* (tìn salvagg), is also a native of these islands. The wild variety produces small and delicate fruits. As many varieties of this tree have been introduced to Malta from abroad, we think proper to include them among the cultivated species. Of the olive, the wild variety of which is also a native of these islands, we shall speak hereafter, and also of the pear, a variety of which grows wild in several gullies of Malta. Also indigenous is the Azarole hawthorn, *Crataegus Azarolus*, called *ghanzalor* by the Maltese, the fruit of which, yellow or red, has an agreeable taste and is by some much esteemed for making tarts. The fruit of the common hawthorn, *Crataegus monogyna*, is very small, and only eaten by children and birds. It is known under the name of *zgharun*. The *Mespilus germanica*, which used to abound in several ravines, especially in the neighbourhood of the Boschetto, belongs now only to the flora of Gozo, where it grows seemingly wild among bushes. It is called *pomm el lip*. The fruit of the wild variety is middle-sized and worthless. The medlar is cultivated in some gardens, where it produces a fruit which, like that of the *Sorbus domestica*, is eaten in a state of incipient decay. *Punica Granatum* and *Ceratonia siliqua* belong to the Flora of these islands, so does *Olea europæa*.

We think that *Ceratonia* should be more extensively cultivated for the sake of the abundant Carobs it produces, called *harrub*, which are eaten by the poorer classes, especially in times of dearth, and form a nourishing food for all sorts of cattle. A very considerable quantity is consumed yearly by horses, it is, therefore, largely imported from Sicily and Cyprus, the quantity of pods produced in Malta being insufficient for this purpose. The Malta Carobs are sold from 2*s*. 6*d*. to 5*s*. per cwt. The Carob tree does not require any particalar culture; it is slow in growing and lives many ages, especially if care be taken to screen it from the cold northern winds which visit us during winter, by planting the young trees on the northern sides of the ravines.

It has been thought best to speak of pomegranate and olive trees, both indigenous, in the section of cultivated trees, the fruit of the wild varieties being worthless.

Cultivated species.

Our soil suits admirably the palatable Peruvian Cherimoyn, *Anona cherimolia*, known under the name of *puma cannella*, which is sparingly grown in some gardens, and the Sweet Sop, *Anona squamosa*, called here *pumacanella ta lixandra*, cultivated only as a curiosity.

Oranges and lemons: If any one were to visit a Maltese garden in January where orange and lemon trees are carefully cultivated he would come to the conclusion that the Hesperides' garden could not have been more beautiful. Oranges and lemons are grown with wonderful success in the central parts of Malta. The highest qualities grow in casals Lia and Musta and their neighbourhood.

We arrange the species of the Citrus tribe grown here into three sections, and we chiefly specify those cultivated for the home market and for exportation thus:—(*a*) Bitter Oranges (*laring kares*), Sweet Oranges (*lumi laring, laring comuni, laring ta Malta*); (*b*) Mandarin Oranges (*mandolina*); (*c*) Lemons: Citrons (*xcomb*), Sweet limes (*lumi helu*) and Common Lemons (*lumi kares*). Seville or Bitter Oranges, *Citrus Aurantium* (the laring kares of the Maltese), are chiefly cultivated for their flowers, from which orange-flower water is obtained by distillation, and for the rind of their fruit, from which marmalade is made. The pulp of the fruit is acid and bitter, and is used by some in lieu of lemons. Bitter oranges are sold at 1*d.* to 2*d.* per dozen. Several varieties are grown, the principal of which are the following: (*a*) Fruit very large with a smooth rind: (*b*) fruit, typical, purplish, with tubercled or wrinkled thick rind; (*c*) fruit of a pale orange colour, with wrinkled rind, pulp sweetish and slightly bitter. Sweet Oranges, *Citrus Aurantium* (laring comuni), are very extensively cultivated and fruit very freely. Malta oranges, being long keepers, and having a very delicate taste, are exported in considerable quantities to distant countries. There are many varieties, of which we deem proper to mention the following: (1) The flat-fruited orange, *laring chatt*, is sparingly cultivated and is much esteemed. Its fruit is large, and the pulp rich in sweet juice. Sometimes the rind is thickish, the pulp not very rich, whilst the seeds are often numerous; (2) Thick-rinded orange, *laring tal kexra hoxna:* Fruit round, rind very thick, juice not abundant nor highly flavoured; (3) China orange, *laring helu* or *lumi laring:* Fruit round, rind thin, yellowish, seeds few or wanting, juice very sugary. It is much esteemed in December and January, when the other kinds are still very sour. It is not a good keeper, and is chiefly cultivated for the home market. The China orange imported from Barbary is sometimes superior in taste to our own; (4) Lemon-formed orange, *xcompa laringia:* Fruit oblong, having the shape of a lemon, and the colour and taste of an orange. It is grown in some gardens as a curiosity, and is very seldom met with in the market; (5) The blood orange, known as laring ta demm (*Citrus Aurantium*, var. *melitense*): There are several sub-varieties, all of good quality, much esteemed both at home and abroad. At maturity the peel is red as blood, the pulp is partially or wholly of a deep red colour, being juicy and delicate, sometimes it is only striped with purplish red. Not being very extensively cultivated, it is exported in small quantities. It finds a ready market at home, realising from 4*d.* to 8*d.* the dozen;

(6) The egg-shaped or oblong orange, *laring tauuali*, forms a very lucrative production for the Maltese gardener: Fruit large, oblong, rind thickish, pulp containing an agreeable juice, seeds few. It is the most perfect of our oranges, and really forms a handsome dessert fruit. It is extensively grown for export, and sold from 4*d*. to 1*s*. 3*d*. per dozen; (7) The fruit of the common orange of Malta typically is round, slightly sub-compressed, smooth, of a golden colour, with a thin rind adhering to the pulp, which is full of a sub-acid pleasant yellow juice. The tree is vigorous, long lived, sometimes very high, covered all over with lichens; the leaves are a deep green colour; it is the most abundant bearer. The fruit is sold from 2*d*. to 5*d*. the dozen, according to size, which varies much.

The pear-shaped orange is rather rare, and seldom found in markets, being but a poor bearer; fruit exquisite.

We believe that the *Citrus Aurantium*, var. *mandarinum*, of Risso (*Histoire naturelle des principales productions de l'Europe méridionale et particulièrement de celles des environ de Nice et des Alpes maritimes*, Tom. I., p. 378), the *Citrus nobilis* of Loureiro (*Flora Cochinchinensis*, p. 466), and the *Citrus deliciosa* of Tenore (*Catalogo delle piante che si coltivanonel R. orto botanico di Napoli*, p. 81), are varieties of but one and the same species, for which we prefer the name of *Citrus nobilis*, by which it is commonly known to botanists. It is called *mandolina*, and is extensively grown, and indeed very productive. The fruit is generally cut off with a few leaves attached; it is reddish outside and inside, having a very delicate juice. There are two distinct varieties: (*a*) fruit round, small, rind adhering to the pulp, juice very sweet; (*b*) fruit large, depressed, rind only here and there adhering to the pulp, from which it is easily separable; its taste is not so agreeable as the other. An excellent marmalade is made from the peel; it is sold from 2*d*. to 8*d*. per dozen. The first variety being a long keeper, is adapted for shipping to long distances. It is the opinion of many that these varieties are due to the soil in which they are cultivated. Of *Citrus Medica*, the citron, we have two distinct varieties: (1) Fruit oblong, very large, and rind very thick, spongy internally, adhering closely to the pulp, which contains a small quantity of greenish and acidulous juice. It is made into confections; this variety is called *trong* by the Maltese, and is sold from 2*d*. to 6*d*. the dozen; (2) Fruit small, oblong, middle-sized, acid, called *citrat*, much esteemed for the agreeable perfume which it exhales. Price, from 2*d*. to 5*d*. the dozen.

The *Citrus Medica*, var. *Limonum*, is the common lemon, known in Malta under the name of *lumi kares* or *xcomp*. The fruit is ovate, oblong, terminated by a nipple-like protuberance, rind thin, adhering to the pulp, which is very acid. Of the 25 varieties described by Risso, the *aspermum*, seedless, the *vulgare*, ordinary lemon, the *racemosum*, the *tenue*, and the *oblongum*, are extensively cultivated. The sweet lemon has a queer taste; it differs from the lemon-shaped sweet lime, and from the lemon-shaped orange; it is sparingly cultivated under the name of *xcomp helu* or *spatafora*. Common lemons are sold from 2*d*. to 4*d*. per dozen, and in summer from 8*d*. to 2*s*.

The fruit of the lime seldom comes to maturity; it is middle sized and green, it is ovate and shining, the pulp green, with a few seeds or without; its juice, which exhales a pleasant perfume, is preferred by some to that of common lemons. It is not extensively cultivated; price from 1*d*. to 3*d*. the dozen.

It is a pity that the Bergamot (*Citrus Aurantium*, var. *Bergamia*) is not largely grown in Malta; of the variety *parva* of Risso a specimen is cultivated in the botanic gardens of this island, yielding numerous middle-sized globose fruits, the rind of which is full of the fragrant oil peculiar to this species. This small tree, 5 feet high, produced in 1887 no less than 16 dozen fruits.

The shaddock (*Citrus decumana*) is very rare in our gardens, where it is merely cultivated as a curiosity. It does not grow high, and produces from one to four very large fruits, which are made into confections. The Maltese name is *xadocc*.

Sweet limes are plentiful; they are known under the popular names of *lumi helu* and *lumi tal caruna*. Of this species (*Citrus Medica*, var. *Limetta*) two very distinct forms are here known: (*a*) Middle-sized, depressed shining fruit, with a large broad nipple-shaped, depressed protuberance, rind thickish, pulp as sweet as sugar; generally eaten by children, and very seldom used for the table; (*b*) fruit round, small, yellow saffron, rind thin with a small tapering, nipple-shaped protuberance. The pulp of this form is more agreeable than that of the other. Specimens are cultivated in gardens, and in courtyards of country houses. Price, 1*d.* to 3*d.* the dozen.

The amount of lemons exported in 1887 was 14,670 dozen, the greater part of which went to Barbary; and not fewer than 110,070 dozen oranges were also exported, the greater part of which went to the United Kingdom, to which country have also been exported six bags of bitter orange peel, weighing upwards of 6 cwt. A large number of young orange trees are annually exported to different countries, as India, America, &c.

Of the jujube tree, *Zizyphus vulgaris*, called *zinzli*, two distinct varieties are sparingly cultivated, the fruit of which is round or oblong, the size of a common olive, and of a queer taste. It is eaten chiefly by children.

It is to be regretted that the cultivation of the vine, *Vitis vinifera*, called in Malta *dielya*, which grows luxuriantly here, is greatly neglected. Its culture is more attended to in Gozo, where it forms an important and profitable branch of rural economy. In marly fields and in the fissures of the limestone strata it grows without demanding any particular care. Maltese grapes are superior to those produced in Gozo. We must admit that our grapes are not so exquisite as those imported from Sicily and Pantellaria. No less than 27 varieties are here cultivated. The white and black cornichon, having a finger-shaped berry, is a showy good grape, called *bezzula* by the Maltese; the black corinth is sparingly cultivated, and is called *passulina;* the royal muscadine, the white muscadine, the white sweet water grape, and other varieties, known under the names of *catalan*, *batuni di gallu*, *zakk el maghagia*, and *ananassa*, are in much repute.

The walls of fields should be covered by vines, and prizes awarded to promote this object. A tolerable sort of white and red wine is made in Gozo by people who do not understand the general principles of wine-making. Our ancestors were cleverer; they made good wine, not less than 47,500 gallons (5,000 barrili) yearly. It would be desirable that a good portion of the 35,200 acres of uncultivated land in Malta should be turned into vineyards with the view of superseding the wretched drinks imported into this island from Sicily, the good wines of which country are either exported to continental Italy and France or consumed by the Sicilians themselves; nor superior are the wines which reach us from the Greek islands. We firmly believe that under an able Italian or French director we could compete with Syracuse successfully both in the production of grapes and in the making of wines. Grapes from August to November are sold in the markets from ½*d.* to 2*d.* per lb. Some varieties are good keepers, so much so, that in some gardens grapes enveloped in thin paper bags are kept up to February and sold at 1*s.* to 1*s.* 6*d.* per lb.

The family of the *Rosaceæ* furnishes our markets from April to June with strawberries (frauli), *Fragraria vesca.* The Chili strawberry is only grown as a curiosity. Strawberries are sold from 4*d.* to 10*d.* the lb.

The loquat or Japan medlar, *Eriobotrya japonica*, nespola or nespli of the Maltese, grows exceedingly well in Malta; its fruit is ripe in the months of May and June, and sold from 1*d.* to 2*d.* per lb. The loquat not being a long keeper is exported to a very limited extent; in 1887 only 20 barrels of it were exported, and those to Egypt.

Several varieties of the pear (*Pyrus communis*) are grown, such as (*a*) common bergamot (*bergamotta*) a sub-variety of which is ripe in November (*bergamotta ta sanguian*) and another in January (*bergamotta ta xitua*); (*b*) *Cuisse Madame* in July is sold in our markets under the name of *gambe di donna;* (*c*) *Muskat* sold in August; (*d*) *Beurré*, of which there are two distinct varieties called *pera butira*, ripe in August and September; (*e*) *Angelique*, rather rare: *pera angelica;* (*f*) the *Pera settembrina* or "Colmar de manne," known also as "Caillot rosat d'hiver" or Malta pear, is an abundant bearer; if not gathered mellow the fruit, which is rich, luscious, and high-flavoured, is a good keeper. They all thrive well, are remunerative, and sell from 4*d.* to 1*s.* per lb. They are seldom exported. We import a large quantity of pears, but only of a coarse quality, from Sicily, and a better sort from Marseilles.

The apple (*Pyrus malus*), toffieh, is largely grown in Gozo, sparingly in Malta. Apples are not exported but sold for local consumption. The principal varieties are: (*a*) *toffieh abiat* or *pumicellta Malta*, fruit small, yellowish, of fair flavour; (*b*) *toffieh ta gian maltia*, fruit yellowish, streaked with red, of a rich aromatic flavour; (*c*) *toffieh ta billudia* of a moderate size, greenish with large deep red patches, seldom eaten raw; (*d*) *toffieh ta regina*, *toffieh comuni*, *toffieh ta ghaudex*, the Gozo apple, is a small very hardy tree producing large fruits, yellowish green splashed with red, flesh greenish white, fine grained, mildly sub-acid and aromatic. Season, September to November, price, 1*d.* to 2½*d.* per lb.

The peach and nectarine commence to ripen their fruit in July; the first, called in Maltese, *hawh* (*Amygdalus persica*), presents two varieties: (*a*) yellow, firm, flesh, *hawh isfar;* (*b*) fruit pale, greenish, or white and red, *hawh ta Malta*, "pêche de Malte," "Belle de Paris," or Malta peach. The Nectarine, called *anciprisc*, has two varieties: (*a*) fruit, middle sized, green-yellow, always red on the sunny side, or wholly dark red; (*b*) fruit, large, and white, *anciprisc francis.* The best of these fruits, when picked, realise from 2*d.* to 3*d.* per lb. The quantity produced is hardly sufficient for local consumption, and consequently it is not exported. The most valuable sorts are the Malta peach and the white nectarine. Large plantation of these trees would be very valuable, as their fruit keeps well if properly gathered, and bears carriage.

The common quince, *Cydonia vulgaris*, called here *sfargel*, is sparingly cultivated in Malta, but in Gozo it is grown in quantity for the manufacture of jams and other confections. The fruit, which is never eaten raw, is sold from 2*d.* to 3*d.* the lb.

It is to be hoped that the bitter and sweet almond, which grow most luxuriantly and fruit freely in Malta, will be propagated all over the island. The bitter almond (*Amygdalus communis*) is called *lewz morr;* the sweet almond, with a hard shell, is called *lewz helu*, and that with a tender shell is called *lewz milliesi.* The quantity produced is not sufficient for local consumption, even for making sweet tarts, nougat comfits, and the like. Formerly the almond was extensively grown. It requires but little care; it blossoms in January, and ripens its fruit in June.

The Apricot (*Prunus armeniaca*) is called *berqùq* or *berkuk*, of which four varieties are sent to market: (*a*) *berkuk ta Meju*, May apricot: fruit early, small, round, flesh pale yellow, high flavoured, kernel sweet; (*b*) *domaschina*, fruit tardy (end of June), oval, shining, middle-sized, firm, straw-coloured, flesh with very little flavour, kernel bitter; (*c*) *berkuk ta saif* or *lixandrina* (Roman apricot?) ripens at the end of June, kernel bitter. It is the most luscious of all varieties; (*d*) *berkuk ta l'imnaria*, the fruit is much like that of the May apricot, but it is tardier, and the kernel is bitter. Apricots are sold from 1*d*. to 2½*d*. per lb. A variety, having a very small exquisite fruit, now only cultivated in the Botanic Gardens, was formerly widely grown. It lives very long, and is an abundant bearer, called *berkuk ta santa Agata.*

Berkuk isuet, abricö, berkuk francis, and *berkuk ta l'Algier* are names given to the "*Abricot noire*" of the French. Its fruit is large, round, slightly compressed, dark purple all through, covered with a whitish bloom, gratefully subacid. It is becoming a popular dessert fruit, which ripens in August, and sells at from 1*d*. to 2½*d*. the lb.

The blackthorn (*Prunus spinosa*), called *prayn*, is grown to perpetuate varieties of peaches, nectarines, and plums, which are budded upon it.

Plums (*Prunus domestica*), called *ghanbakar*, succeed remarkably well; they are abundantly cultivated, especially in Gozo. Several varieties are grown: (*a*) the *pruna di frati*, that is monk's plum, sparingly cultivated, is a first rate dessert fruit, deep yellow, ripening at the end of August. It is pear-shaped, the flesh adhering to the stone; (*b*) greengages, *ghanbakar abiat*, are also plentiful; August, September, 1*d*. to 2½*d*. per lb.; the *pruna dei frati* from 2*d*. to 4*d*. per lb.

As far as we can learn of the true service tree (*Pyrus Sorbus*), known here as *zorba*, only a couple are cultivated, which produce pear-shaped fruits of a medium quality.

It is to be regretted that cherries are here cultivated only as a curiosity. The only sort we have seen grows vigorously, and is very productive; the fruit is large, deep purple, firm, and sweet, May to June.

The common Guava, *Psidium Guava*, grows freely in some gardens, and ripens occasionally a few berries of a pleasant taste.

Pomegranates, *Punica Granatum* (called *rummiena* in Malta), are almost exclusively grown for the market. They prefer moist soil, and thrive admirably in marly fields. No less than 12 varieties are here cultivated, differing the one from the other by the colour and size of the fruit, and of the seeds: (*a*) one of these varieties has been called *melitensis*, the fruit of which is red and round, slightly depressed, with a thick rind, and large red seeds covered with a very sweet agreeable pulp, which variety, from the size of the seeds, is called *smèn el baghal*, that is mule's teeth, and in Italy, "Melagrana di Malta"; (*b*) another variety is called *rummien ta San Guisepp*, the seeds of which are a little smaller than those of the "Melitensis"; (*c*) *rummien francis*, or *rummien ta Santa Rosa*, or *ta bla ghadma*, or *rummien ta Santa Caterina*, has small very tender seeds, and very sweet pulp; it is much esteemed as a dessert fruit; *bullar* is the acid, and *rummien ta guida* the wild variety. Pomegranates are sold in the market from October to January from ½*d*. to 1*d*. per lb. Eighty cases of pomegranates were exported to England in the course of last year.

The Maltese water melon, *Citrullus vulgaris*, (phaira dollieh) is, as a rule, of medium quality. The pulp is either white, yellow, or red, sometimes granular, and very sugary. Its quality depends much upon the soil, locality, and the nature of the summer. It is a bad keeper, and sells from ¼*d*. to 1*d*. per lb.

Next to oranges the melon, *Cucumis melo*, is the richest of the fruits produced in Malta. The following are the varieties exposed for sale in markets: (*a*.) *bettieh ta L'Ahrax*, netted melon of Malta, "Melon muscat de Malte," fruit roundish or oblong, thickly grey, netted, pulp thick, pale orange or salmon coloured, high flavoured, scenting of musk, rather coarse to some palates, very abundant in summer, bad keeper, from ¼*d*. to 1*d*. per lb.; (*b*.) *bettieh tal curuna* or *ta xitua*, round, sometimes oval or sub-compressed, rind green or yellow, often streaked with either green or yellow, thin netted at the extremity, flesh green, often salmon coloured at the inner part, in which case it is generally sweat-scented, long keeper, price as above; (*c*.) *bettieh ta spagna*, "Melon de Malte à chaire blanche," fruit oblong, rind smooth, green or yellow, flesh white or green, and very sugary. It is held in great esteem, often weighs 10 lbs., and even more, the ordinary weight being from 3 to 6 lbs., very long keeper. We are at a loss to understand why it is not largely exported. During last year only 248 cases of melons were exported to England and Egypt. Every second year the seeds of this variety are imported from abroad, for melons easily degenerate. The cantaloupe of Paris and that of Valparaiso have been introduced into the Botanic Garden successfully, but they began to degenerate after the second year by losing their grooves.

The *Opuntia Ficus-Indica*, or prickly pear, (the *baytar ta l'Indya* of the Maltese) is extensively cultivated for its large edible fruit, which is white, *baytar francis*; yellow, *baytar isfar*, or purple, *baytar ta demm*. There is a seedless variety *baytar ta bla zerrigha* which is very rare. The yellow fruit is more sugary than the others. Prickly pears are very abundant in summer, and are sold at a very low price, ¼*d*. per lb., and even less. Only Pantelleria can surpass Malta for the quality of prickly pears. There is a winter crop, which is scanty and not so saccharine as the summer produce, sold from 1*d*. to 2*d*. per lb. The plant is of a very easy culture: a branch of three or more joints (improperly called leaves) separated from the tree and allowed to lie several weeks to dry, and then put into any soil, even of the worst description, soon strikes root. It is productive after three years, and lives from 20 to 30 years, and even more if proper care is bestowed upon it. Trees manured every four years produce delicious fruit, and not so full of seeds as when no care is taken in their cultivation. Prickly pears are plentiful from July to November. The prickly pear plant is so well adapted to our climate that it should be more extensively grown, for both the "leaves" and the rind are given to sheep and oxen in the summer when green fodder is not obtainable.

The European olive, *Olea europæa* (zebbùg in Maltese, and zeitun in Arabic), is a native of the south of Europe, and grows wild in several parts of this island. The fruit of the wild plant, *O. Oleaster*, is small and valueless. The cultivated variety, *sativa*, was in olden times extensively grown here; the names of Casals, Zebbug, and Zeitun, show how abundantly the olive was cultivated in Malta. During the Roman dominion, and subsequently in the 15th century, so much oil was drawn from the Maltese olives that Malta was called the oil-shipper of the Mediterranean. The pickled olives of this island were held in great esteem by epicures. It is really desirable that this useful and very profitable tree, which is now sparingly cultivated, should be again widely and generally grown. Though a slow grower it thrives wonderfully in low and high localities, even in the most ungrateful soil, and in the crevices of calcareous rocks. The sides of the ravines should all be covered by plantations of olives. We have reason to believe that the variety *præcox* of Risso, which produces a large, oblong, dark fruit is preferable to other varieties.

The fig tree, ***Ficus Carica***, variously called by the Maltese *baitar ta San Guian*, *tin*, and *parsott*, &c., grows most luxuriantly in Malta, and the fruit of all its numerous varieties, *sigiar tal halip*, come to perfection. Of first quality are those known under the name of *parsott* and *farchizzan*, which are pear-shaped or obovate, dark purple, covered with a whitish bloom. The variety *farchizzan* is considered by Risso as special to this country. The fruit of this is of a deep violet colour and reticulated. Of medium quality is the *bzengul*, oblong, sometimes three inches long (in Gozo). Some of the green figs (*tin abiat*) are indeed very sweet, covered when gathered with a thin white bloom. The variety called *tin gludi* (October) is coarse. The so-called *zondadari* figs having been introduced, as it is supposed, by the Grand Master Zondadari from Siena, are round, covered with a whitish bloom, internally red, and of a good flavour. All these varieties ripen in August; they are sold in large quantities in markets and by country-women in the town streets at ½*d.* or less per pound, the choicest varieties being sold at 1*d.* per lb. There is an early variety called *baitar ta San Guian*, which ripens in June, the fruit of which is large, purple or green; the quality depends much upon the nature of the soil in which the tree is cultivated. The fruit coming from the districts of Zabbar and Mellieha, especially those coming from the latter, are most esteemed, whilst that from the district of Città Vecchia is less thought of. St. John's fig-tree produces a second crop of an inferior sort in August and September. With the exception of the St. John's figs, all varieties are dried by the country people for their own use, and for village shops.

The white mulberry, *Morus alba* (cewsi, chewsi, or chawsli), was widely cultivated when its leaves were wanted for the silkworm, the rearing of which is now entirely abandoned. We have two distinct varieties: (*a*) *meridionalis* of Risso, with a purplish, sweet fruit; and (*b*) *vulgaris*, with a white, very saccharine fruit. The fruit of both varieties is eaten only by children and the poorer classes. It is a splendid food for fowls. This tree might with advantage be occasionally substituted for the ***Phytolacca dioica*** which, as yet, has been almost the only tree planted along the sides of our public roads.*

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* *Phytolacca* (Pircunia) *dioica*, a member of the *Phytolaccaceæ* or Poke-weed Order, called Bella Sombra, is an umbrageous tree of South America introduced to the south of Europe, where it is planted as a shelter in public promenades. Other species of the genus Phytolacca are herbaceous plants, common in most tropical countries.

The black mulberry, *Morus nigra* (tùt in Maltese), has a large dark purple acidulous fruit, which ripens in summer and soon decays; it is consequently eaten within a few hours of its being gathered. The fruit is made into a preserve, which is very pleasant and cooling.

The walnut, *Juglans regia* (geus in Maltese), thrives here wonderfully, as is evident from the few trees cultivated in some gardens. Its fruit attains the same degree of perfection as in Sicily. It is desirable that this tree should be cultivated at least for local consumption.

The stone-pine, *Pinus Pinea* (*prinioli*), grows vigorously in some gardens, and produces abundant cones containing the edible seeds known as *Pignons doux*.

Although palms grow here luxuriantly, and the date palm especially, nevertheless dates seldom, if ever, come to perfect maturity. Protected from winds and placed in rich soil, and often watered, plantains (*Musa sapientum*) grow here, and fruit remarkably well.

The banana is especially cultivated in courtyards, where it produces rich bunches of first-rate fruit. The Abyssinian banana (*Musa Ensete*) and a decorative sort known as *Musa ornata* are thriving wonderfully in the Botanic Garden, but as yet have not borne fruit.

Of the *Aroideæ* the *Tornelia fragrans*, also known as *Monstera deliciosa*, was introduced to the Botanic Gardens about three years ago. The fruit in a perfect state was much admired, both for its beautiful perfume and the delicate taste, and was by many considered superior to the pine-apple. Though a slow grower the plant requires but little cultivation, and is easily propagated by cuttings. As far as we can learn, it has not fruited in Italy, where it was introduced some 10 years back by Professor Pasquala. It is abundantly cultivated in Mexico, where it is highly esteemed, and realises a good price. Being a bad keeper it cannot be easily exported.

With a view of completing our report, we annex herewith a table showing the kind, quantity, value, and derivation of fruits imported into this island in the year 1886.

Before concluding, we may perhaps be allowed to submit another proposal. Its utility is so apparent that we will not dwell on its merits, which we consider are alone sufficient to commend themselves to those on whom its adoption may depend. It would be of great advantage to institute an experimental garden, where productive trees and shrubs could be tested in their climatic adaptations, and their economic value accurately determined.

The Botanic Garden, having so small an area and teeming with plants, is insufficient for this purpose, nor is the locality adapted for such experiments. The institution of such a garden free to the public would be a most valuable source of information and instruction. This, we think, is a decisive step to be taken at once. It has been done in all civilized countries where new methods of horticulture and new plantations have been introduced.

GAVINO GULIA, M.D.,
Director of the Botanic Garden, Malta.

Fruits imported into Malta during the Year 1886.

Fruits.	Countries whence imported.	Quantity.	Value.		
		Cantars.	£	s.	d.
Almonds	Italy, Barbary	399·14	480	0	0
Do. peeled	Italy	128·75	764	5	0
Apricots	Barbary	93·70	60	6	0
Cherries	Italy	243·	182	5	0
Chestnuts	France, Italy	3,125·60	287	12	0
Do. peeled	Italy	336·	252	0	0
Do. baked	Italy	350·	180	0	0
Currants	United Kingdom, Turkey, Greece	583·05	1,041	3	0
Dates	France, Tunis, Barbary	6,114·17	12,207	18	0
Figs, dried	Italy, Turkey, Greece, Egypt	1,785·79	2,198	11	6
Fruit	Italy, Turkey, Barbary	2,238·60	914	15	0
Do. dried	United Kingdom	12·	7	4	0
Do. preserved	Italy, Barbary	132·68	247	7	6
Do. candied	France	·06	0	6	0
Grapes	Turkey	145·	50	14	6
Ground Nuts	France	246·85	370	5	6
Melons	Barbary	4·02	1	0	0
Mandarins	Italy	·50	0	10	0
Nuts	France, Italy, Turkey, Tunis, Barbary, Greece.	3,322·10	2,496	4	0
Oranges	Italy, Barbary	1,380·20	1,034	12	6
Apples	Barbary	289·20	80	8	0
Pomegranates	Italy	·70	0	5	0
Pears	Italy	1,417·45	708	10	0
Prunes		·80	0	12	0
Pistachio Nuts	Egypt	21·35	138	5	0
Raisins	Italy, Barbary, Egypt	538·80	806	12	0
Walnuts	Italy	790·60	108	13	0
Tomatoes	Italy	1,462·75	438	17	0
		25,162·86	25,059	1	6

One Cantar is equal to 175 lbs.

Cyprus.

The following interesting Report on the fruits of Cyprus, forwarded by the Government, has been prepared by Mr. A. F. G. Law, Principal Forest Officer:—

The chief fruits grown in Cyprus are:—

Name.	When in Season.	Local Price.
Grapes	July to November	½ to 2 piastres per oke.
Caroubs	Ripen in August	11*s.* to 16*s.* per cantar.
Olives	October to December	3 to 6 piastres per oke.
Oranges	December to May	2*s.* to 3*s.* per 100.
Bitter do.	Do.	4½ to 6 piastres per 100.
Mandarin do.	December to February	2*s.* to 3*s.* per 100.
Lemons	September to May	2*s.* to 3*s.* per 100.
Do. Sweet	December to March	2*s.* to 3*s.* per 100.
Citrons	January to February	Sales so rare that there is no fixed market price.
Figs	August to October	½ to 2 piastres per oke.
Pomegranates	August to January	1 to 2 piastres per oke.
Apricots	June and July	½ to 1½ piastres per oke.
Peaches	August to October	2 to 4 piastres per oke.
Plums	Do.	½ to 2 piastres per oke.
Almonds	September to October	3 to 5 piastres per oke, or 13*l.* to 22*l.* per ton.
Walnuts	Do.	1 to 3 piastres per 100.
Hazel nuts	July to September	2 to 4 piastres per oke.
Cherries	July and August	1 to 3 piastres per oke.
Apples	September to December	3 to 5 piastres per oke.
Pears	September to January	2 to 4 piastres per oke.
Quinces	October to December	3 to 5 piastres per oke.
Bananas	August to November	Barely sold, no sale price can be given.
Melons	June to October	1 to 3 piastres per oke.
Water melons	Do.	½ to 2 piastres per oke.
Prickly pears	August to November	3 piastres per 100.
Dates	July to September	2 to 5 piastres per oke.

The oke equals 2·7 English lbs.

The Aleppo cantar, the one referred to in this report, equals 180 okes.

Nine of the piastres mentioned equal one shilling.

The only fruits of which there is any export to speak of are caroubs, oranges, lemons, pomegranates, and grapes in the form of raisins.

Grapes are produced in most parts of the Island. The grapes from the hill districts make the best wine. The removal of the tithe on grapes in 1884, and the spread of Phylloxera in Europe have given great impetus to vine planting for the purpose of making wine. Fresh grapes are exported in small quantities to Alexandria and Port Said.

Raisins are made in most of the hill villages, and are principally exported to France. In the year 1885–86 the export was 440,206 okes, value, 4,947*l.*, and in 1886–87, 599,880 okes, value 7,011*l.* Raisins of a superior quality are imported in small quantities from Smyrna.

Caroubs (*Ceratonia siliqua*) are chiefly exported to England, France, and Italy, although in the year 1885–86 the largest export was to Spain. In 1885–86 the export was 96,233 cantars, value 74,562*l.*, and in 1886–87 the export was 124,463 cantars, value 102,723*l.*

Olives grow in most parts of the Island; and on the waste lands in the hill districts the wild olive is one of the commonest trees; it bears well being transplanted if the operation is carried out with care. The Cypriots do transplant large numbers of wild olive trees from the hills to their villages, but in many cases a considerable per-centage of the trees die, because the work is not carried out with proper care and attention. The black olives are as a rule of good quality.

A sample of Cyprus oil sent to the Colonial and Indian Exhibition was reported on by Professor Leopold Field, F.R.S.E., F.C.S., in the following terms:—"Cyprus also exhibited some excellent though "unrefined olive oil, and doubtless will prove in time to come a formid-"able competitor of the Italians in a line now almost monopolized by "them." If Cyprus oil commanded a high price in the European market, olive cultivation would be greatly extended, affording a very profitable occupation to the agriculturist.

Oranges will grow in almost all the villages of the plains, but the cultivation of them is much neglected; they are chiefly grown at Famagusta, Nikosia, and Lefka. There is a small export trade with Alexandria and Port Said, which might perhaps be extended to England if there was any direct means of communication, although the ordinary orange of the country is not of the best quality.

Mandarin oranges are grown in small quantities and are of good quality. They graft well on to the bitter orange stock.

Lemons are much grown, but there is a large local consumption, the lemon being commonly used instead of vinegar. The quality of the fruit is good. Green lemons come into the market about September, and last on until May. In 1885–86, 2,263,331 oranges and lemons were exported, value 508*l.* In 1886–87, 3,343,638 oranges and lemons were exported, value 1,079*l.*

Citrons.—Few are grown, and are mostly used for making preserves for local consumption.

Figs are extensively grown in most parts of the Island, but not more than sufficient for local consumption are produced. They are not of very fine quality. Dry figs are imported from Smyrna, Beyrout and Tripoli.

Pomegranates are principally grown at Famagusta. A small export trade is carried on with Port Said and Alexandria.

Apricots are produced in large quantities; the trees are not usually grafted, but are much improved by grafting. Dried apricots and apricot pastes are imported in considerable quantities from Beyrout.

Peaches are only grown in small quantities; the trees are sometimes grafted, which very much improves the flavour of the fruit.

Plums are generally of an inferior quality and are chiefly used for preserving. Plums are also imported in small quantities from Kilindria in Asia Minor.

Almonds give about the best return of any fruit crop in Cyprus. Great impetus has been given to the planting of these trees of late years. The tree requires little or no attention, although if it can be watered so much the better. In the plains it produces large crops every other year. The grower acquires a great advantage by being able to wait for a good market, and by there being at present no tithe to be paid on the fruit. The quality as a rule is not of the best, the greater part being a small hard-shelled almond, but lately seed has been introduced from Chios of a soft-shelled kind.

In the hill districts the crops generally suffer from late frosts. The Chios almonds are much esteemed in the East and many people, who possess some special knowledge in the matter, believe that almonds might be very largely grown in Cyprus with great profit. Almonds are imported in small quantities from Kilindria and Mersina.

Walnuts grow well in the hill districts where there is running water and the climate is not too hot. They are exceedingly fine trees and the fruit is fairly good.

Hazel nuts are grown largely in the district known as Pitzillia; they are of very fine quality and a paying crop, but in Cyprus they require much care to do well. The ground should be broken up round the roots every spring and the trees irrigated until the crop is gathered.

Cherries grow plentifully in the Marathassa valley at a height of more than 4,000 feet above the sea-level, but the fruit is not of good quality.

Apples are only grown in any quantity in the village of Prodromo, 4,500 feet above the sea-level; they are of inferior quality and only fit for cooking.

Pears are only grown in any quantity at present about 3,500 feet above sea-level. The quality is not good. Fairly good pears can however be grown in the plains.

Quinces are grown in fair numbers and are of good quality.

Bananas are cultivated in the towns in private gardens, but not to any great extent; they seldom come into the market. The Paplios bananas are of fine quality and very large.

Melons are grown largely in most gardens; he quality is fairly good but might probably be improved by the introduction of new seed.

Water Melons grow well and attain an immense size.

Prickly Pears grow abundantly in the low country; they furnish useful fences. The fruit is good. The supply is equal to the local demand. There is no export.

Dates are only grown in a few places, and are generally of an inferior quality. The dates consumed in the island are mostly imported.

Besides the above fruits, *medlars* are grown, but are very small; they are all consumed locally, and the quantity is insignificant.

Strawberries will grow if properly attended to; quite an insignificant number is grown in the island.

Capers grow wild in the hills. They are pickled in a rough way by the inhabitants. It seems likely that by cultivation and proper attention an export trade might be established.

All the fruits of Cyprus are capable of being produced in much larger quantities than at present, and there is also no doubt that the quality of most of the fruit might be greatly improved; but this will not be done until the subject of fruit-growing is much better understood than it generally is at present. The Cypriots make most excellent jam and preserved fruits, but little or none of these come into the market; households, as a rule, making only for themselves. I think it would be well worth while for someone, who understands the business, to consider whether a manufactory of marmalade and jam, especially apricot jam, could not be worked here with profit.

If a fruit trade is to be developed, which I believe to be quite possible, it would be necessary to provide better means of communication within the island, and better, quicker, and, above all, more regular communication with foreign countries.

A. F. G. Law, Principal Forest Officer.

CEYLON.

The following report on the fruits of Ceylon has been prepared by Dr. Henry Trimen, F.R.S., Director of the Royal Botanic Gardens, Peradeniya:—

A list of the fruits grown in Ceylon would include nearly the whole of those found in the tropics, for though the really native fruits of any value are very few—the Jambu, the Plantain and the Goraka (*Gracinia Cambogia*) being the chief—there has been introduced at various times nearly every fruit of importance suitable to the climate. And, owing to the remarkable differences in the climatic conditions of various parts of Ceylon, we are able here to cultivate a greater variety than would be expected in so small an area. Thus, in the humid districts of the South-west, most Malayan fruits come to perfection, the Durian, Mangosteen, Rambutan (*Nephelium lappaceum*), Bread fruit, Nam Nam (*Cynometra cauliflora*), Java Almond (*Canarium commune*), Santol (*Sandoricum indicum*), Langsat (*Lansium domesticum*), &c., as well as other tropical sorts such as the Sapodilla, the Custard-apple (*Anona squamosa*), and the Cochin-Goraka (*Garcinia xanthochymus*). In the low country generally the common fruits of tropical countries are to be found: the Mango, Papaw, Guava, Pomegranate, Pine-apple, Tamarind, Cashew nut, Avocado Pear, Pumelo, Sour Sop (*Anona muricata*), Bullock's Heart (*Anona reticulata*), Lime (*Citrus Medica* var. *acida*), Lovi-lovi (*Flacourtia inermis*), Kottamba (*Terminalia Catappa*), Star Apple (*Chrysophyllum Cainito*), Bilimbi (*Averrhoa bilimbi*), Granadilla (*Passiflora quadrangularis*), and many others. In many places, at a slight elevation and more moderate rainfall, a few fruits of sub-tropical countries can be grown, as the litchi, the loquat, and the wampi, whilst in the hot regions of the North and East, gourds of various kinds are largely grown, and in a few places on the coast even grapes are successfully ripened under a system of artificial wintering. I must also mention the ubiquitous orange, which, though not a tropical fruit naturally, succeeds so well in tropical countries, and is grown throughout Ceylon under several varieties, of which the true thin-skinned "Mandarin" is the best. The rind of all our oranges retains a dark green colour when fully ripe and fit for eating. In the hills, especially those of the drier districts in Uva, some fruits of still more temperate character do well, especially peaches, figs, and less successfully plums, apples, and strawberries.

It must be admitted that many of these fruits are grown in very small quantities, and that very little pains have been taken to cultivate or improve fruit generally. In the village gardens the sorts chiefly seen are plantains, limes, bullock's-hearts and pine-apples, but they are grown carelessly and without method. It must, however, be remembered that the jack is in very general cultivation, and however distasteful to Europeans, is more largely consumed than any other fruit by the poorer natives. The habits of the people are not suited to any careful fruit cultivation; pilfering from one another's gardens is universal, and it is only by constant watch that any fruit can be kept on the tree till ripe. In the neighbourhood of the ports of Colombo and Galle, however, there has taken place a considerably increased production of such fruit as can be sold to the dubashes and bum-boat men who supply the ships. It appears that this trade has become one of considerable magnitude, but no record of its amount is obtainable. It is certain that the quality is usually very inferior, and the prices paid to the native growers extremely low. The trade needs encouragement and regulation, and its details are well worthy the careful attention of the agents of the great mail steam companies at Colombo.

With the exception of this supply to the ships there is practically *no* export of fresh fruit from Ceylon.

The Colony is indeed an importer of fruit instead of an exporter, but those imported are chiefly for the European residents. I do not know if it be true of the eastern tropics generally, but in Ceylon there is among English people no great liking for tropical fruits, and few people consider them in any way comparable with temperate and sub-tropical ones. Hence there is a large import of the excellent tinned and bottled fruits of America and England; but the quantity cannot be ascertained, as nearly the whole is entered at the Customs under oilman-stores generally. Fresh apples and pears are also imported from Australia to a slight extent; in the year 1886–7 to the value of Rs. 692/25.

Whether this low opinion of tropical fruit would be general among English people I cannot say, but it would certainly be largely entertained, and for my part I much doubt if, after satisfying the curiosity which most people feel on the subject, there would be much further demand at home for most kinds. Pine-apples and plantains (bananas of West Indies) may be excepted, being already well known and generally liked. The question of the export of fresh fruit, however, is not one which possesses any practical interest for Ceylon. We are too distant from home to endeavour to send thither fresh fruit as a commercial speculation; Australia with its fine and varied climate can grow all the fruits it needs, and we have no other market within reach.

As regards preserved fruit our exports are trifling. The small quantities sent are all without doubt presents from residents to friends at home, and have no commercial significance. The actual values have been, in 1882, Rs. 280; in 1883, Rs. 102; in 1884, Rs. 239; in 1885, Rs. 296; in 1886, Rs. 105.

There is no information as to kind of fruit preserved, but in all probability they were samples of the jams and jellies commonly made here from such acid fruits as the Lovi-lovi (*Flacourtia inermis*), Bilimbi (*Averrhoa bilimbi*), Carambola (*A. Carambola*), or Nelli (*Phyllanthus emblica*). These are palatable enough and are generally liked, but can scarcely compare with the excellent jams made in England. Of these latter the import into Ceylon must be very large, but as in the case of bottled fruit, all are entered simply as oilman-stores, and the quantity cannot be ascertained.

I cannot but think that an export trade might, however, be set on foot in preserved plantains and pine-apples. These can be readily and very cheaply grown in any quantity and of fine quality. Plantains, simply sliced and dried in the sun like dates, are very tasty and nutritious, and would, I believe, be likely to sell at home if cheap. A trade in preserved pine-apples has sprung up at Singapore and might well be also attempted here in Ceylon.

Henry Trimen.

STRAITS SETTLEMENTS.

The following are the principal fruits grown in the Straits Settlements :—

A.

Plantain	*Musa sapientum.*
Pine-apple	*Ananas sativa.*
Durian	*Durio zibethinus.*
Mangosteen	*Garcinia Mangostana.*

B.

Rambutan	*Nephelium lappaceum.*
Champedak	*Artocarpus polyphema.*
Jack	„ *integrifolia.*
Rambeh	*Pierardia dulcis.*
Orange	*Citrus Aurantium.*
Pumelo	„ *decumana.*
Lime	„ *Medica* var. *acida.*
Chiku	*Achras Sapota.*
Soursop	*Anona muricata.*
Pulassan	*Nephelium mutabile.*
Jambu	*Eugenia Jambos.*
Duku	*Lansium domesticum.*
Mango	*Mangifera indica.*
Custard-apple	*Anona squamosa.*
Bullock's Heart	„ *reticulata.*
Papaya	*Carica Papaya.*
Melon	*Cucumis Melo.*
Water-melon	*Citrullus vulgaris.*
Granadilla	*Passiflora quadrangularis.*

C.

Bingay	*Mangifera cæsia.*
Guava	*Psidium Guava.*
Rokum	*Flacourtia inermis.*
Sintol	*Sandoricum indicum.*
Bachang	*Mangifera fœtida.*
Blimbing	*Averrhoa bilimbi.*
Carambola	„ *Carambola.*

The four fruits in Class A. are certainly the most important grown in the colony. The fruits in Class C., and many others, are eaten only by the natives. It is difficult to arrange fruits in order of importance; the arrangement here must be considered as approximate only.

There are two fruit seasons, July and August, and December and January; the July season being as a rule much the most important; but the quantity of fruit at each of the seasons depends very much on the wetness or dryness of the weather, which varies considerably from year to year. In 1887 (an unusually wet year) there was no fruit in the July season; orchards which usually let for $600 a year being worth nothing. In the December season of the same year the supply was much larger than usual. Some fruits, *e.g.*, plantain, pine-apple, are procurable nearly all the year round, though more plentiful in the regular fruit seasons. In Sarawak (Borneo) the fruit seasons are at the same times, but the December season is the more important. It is difficult to say what quantities are available for export and what the local prices are.

In the height of a good fruit season the supply is so plentiful that large quantities of fruit are sold for almost nothing, or even destroyed. Some months ago pine-apples were very plentiful: M. Bastiani, who does a large business in preserved fruits, offered to buy a large quantity brought from neighbouring islands at ¾ cent each; they had never previously been sold for less than one cent apiece, and, sooner than go below this price, the Chinese importers threw them all into the sea. Durians, early or late in the season, are worth from 25 to 50 cents each; when plentiful they sell for five or six. The following prices may be considered roughly to represent the price of fruit when plentiful:—Plantains, per bundle of 30 to 40, 7 to 10 cents; pine-apples, per hundred, $1½ to $2; durians, each, 10 to 15 cents; mangosteens, per hundred, 10 to 15 cents.

Fruits exported in a fresh state:—(1) mangosteens, (2) pine-apples, (3) durians, (4) rambutans, and perhaps some others in small quantities. No record is kept. There is a large trade in fresh fruit between Singapore, Penang, Malacca, and the States of the Malay Peninsula. Considerable quantities also go to Sumatra, China, Ceylon, India. The value of fresh fruit exported, according to Government returns, is over $30,000 yearly, but this includes the local trade.

Fruits exported in a preserved state:—Pine-apples and mangosteens, the former in considerable quantities to Europe, China, India, &c. The annual value of the preserved fruit exported exceeds $100,000. Messrs. Bastiani, the chief preservers of fruit here, give me the following particulars of the quantities they exported during 1887:—

Pine-apples, 340,000 tins. About 200,000 to England; some to Siberia, North America, Australia; a few to South America and Japan.

Mangosteens, 20,000 tins. Chiefly to Europeans homeward-bound.

Guava jelly, pine-apple jam, bread-fruit, 15,000 tins. Chiefly to Europeans homeward-bound.

The supply of fruit is now sufficient for local wants. All the important fruits would be produced in much larger quantities if there were a market for them. With a railway to India or China, or ships with ice-houses, fruit-growing would become an important industry.

Fresh fruits imported:—

1. Plantains in large quantities, chiefly from the islands of the Dutch Archipelago. The number of plantains grown in the Colony is probably not one-tenth part of the number consumed. The plantain, mangosteen, pumelo, Chinese date, &c. are picked before ripe, and ripen on their way from place of production to place of consumption. The quality, however, of fruit ripened this way is inferior.
2. Oranges in large quantities from China, from October to February. The local orange, obtainable all the year round, are very inferior to those imported from China.
3. Pumeloes and mangoes in considerable quantities from Siam, Java, &c. These are among the best fruits obtainable in the Colony. Those grown locally are very inferior.
4. Chinese date (*Diospyros kaki*) in considerable quantities from China, from October to January.
5. Apples, pears, grapes, peaches, in small quantities and of inferior quality from China.

The total value of fresh fruit imported in 1886 was $183,000, of which $85,000 worth came from China.

Preserved fruits imported:—

1. Dried dates in large quantities from the Persian Gulf.

2. Litchee; a small quantity of litchees (*Nephelium Litchi*) from China.
3. Apples, peaches, plums, &c. from Europe. There is a considerable demand for these among the Europeans and wealthier natives.

The fruits of this Colony are inferior as compared with tropical fruits generally; this is due chiefly to the poorness of the soil. But there are two fruits which would grow to perfection—the mangosteen and the durian—and which are not obtainable from other parts of the world. If there were possibilities of exporting these fruits fresh to Europe, the mangosteen certainly, and possibly the durian, would find a ready sale. They would be available in considerable quantities in January, February, March, when other fruits are scarce, and the trade in fresh fruit between this Colony and Europe would be of commercial importance. It must be remembered too that money spent now on fruit-growing is not well invested. If there were a ready sale for fresh fruit, capital would at once be devoted to fruit-growing, and it is probable that many of the fruits now grown would be much improved in quality.

ST. HELENA.

The following information has been received respecting the fruits of the island of St. Helena in a despatch from Mr. W. Grey Wilson, administering the Government:—

St. Helena, January 23, 1888.

I have the honour to acknowledge the receipt of your circular of 30th November last, calling attention to the portion of Mr. Stanhope's circular of the 17th November 1886, respecting colonial fruits, which has remained unanswered.

The chief fruits of the island in order of importance are: Guava, peach, banana, loquat, pear, fig.

No island fruits are grown in sufficient quantities for export, and of late years the supply has hardly equalled the local demand. This falling of in the fruit supply is due to the terrible ravages of a fly which fills the fruit with maggots.

The island imports some grapes and oranges from the Cape; but the rates of freight charged by the mail steamers are so extortionate that the amount is very small.

The cultivation of grapes has entirely ceased, and none are now grown on the island, blight having destroyed all the trees.

W. GREY WILSON.

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ROYAL GARDENS, KEW.

BULLETIN
OF
MISCELLANEOUS INFORMATION.

No. 23.] NOVEMBER. [1888.

LX.—LAGOS RUBBER.

(*Ficus Vogelii*, Miq.)

The investigation of plants likely to yield the caoutchouc of commerce is being carried out in West Tropical Africa by numerous correspondents of Kew. Possibly in no other part of the world is there such a wide field for investigation of this kind, and in recent years a considerable trade in india-rubber has arisen through the exertions of officials and traders who have given attention to the subject.

A useful summary of information respecting West African rubbers is given by Captain Moloney in the *Forestry of West Africa*, pp. 78–95. At present the chief rubber-yielding plants on the west coast appear to belong to species of *Landolphia*. These are climbing shrubs with stems 4 to 6 inches in diameter near the ground, but dividing above into numerous branches which support themselves on the neighbouring trees. The rubber of the Gold Coast, known in commerce as Accra rubber, is the produce of *Landolphia owariensis*, Beauv. This is probably the best rubber plant in West Africa. The rubber is obtained by cutting off portions of the bark in strips varying in length from 3 to 10 inches. The cuts are made sufficiently deep to reach the latex canals, and soon the crude juice starts out in drops and gathers on the newly-cut surface. The rubber of the *Landolphia* coagulates on exposure to the air and requires no preparation other than rolling it

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY EYRE AND SPOTTISWOODE,
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1888.
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up into balls. "A quantity of the milk is first dabbed on the fore arm " of the operator, and being peeled off forms a nucleus of the ball. " This nucleus is applied to one after another of the fresh cuts, and " being turned with a rotary motion the coagulated milk is wound off " like silk from a cocoon. The coagulation takes place so rapidly on " exposure to the air that not only is every particle cleanly removed " from the cuttings, but also a large quantity of semi-coagulated milk " is drawn out from beneath the uncut bark, and during the process a " break in the thread rarely occurs" [Kew Report, 1880, p. 40].

Another method of collecting West African rubber is described as follows: The blacks wipe off the milk with their fingers and smear it on their arms, shoulders, and breasts until a thick covering of rubber is formed. This is peeled off their bodies and cut into small squares, which are then said to be boiled in water. In European markets such rubber appears in more or less agglutinated masses of small cubes. Specimens of such rubber are shown in the Kew Museums under the name of Thimble rubber [*ib.*, p. 39].

The quantity of rubber exported annually from West Africa from British and other possessions is about 30,000 cwt. The value in 1885 was 265,617*l.*

It appears that in some districts, such as the Gaboon, owing to the reckless destruction of rubber vines the trade is becoming less and less every year. In the other districts the trade is gradually increasing. Attention has been specially directed to rubber plants in the colonies of Gold Coast and Lagos, and owing in a great measure to the interest taken in the subject by Captain Moloney, the exports from these British possessions have risen from nothing in the year 1882 to a value in 1885 of 69,911*l.*

There are doubtless other plants in West Africa from which commercial rubber might be obtained. The Mbungu rubber plant is *Landolphia florida*, Bth. This is distributed over the whole of Central Tropical Africa. There are also several species of Ficus, the original genus yielding commercial rubber which deserve to be investigated.

We are glad to find that following the enterprising example of the Governor of the Colony of Lagos, Captain A. C. Moloney, C.M.G., Mr. Alvan Millson, Commissioner of the Western District residing at Badagry, has recently given attention to the preparation of commercial rubbers from the latex of the trees generally known there as "Abba" trees. Mr. Millson previous to taking up his duties at Lagos had served in British Honduras, where he had become acquainted with the preparation of what is known in commerce as Nicaragua or Central American rubber, the produce of *Castilloa elastica*. A contribution on this latter subject from Mr. Millson will be found in the *Kew Bulletin* for the month of December 1887, p. 14.

The investigations undertaken by Mr. Millson in West Africa are described in the following notes which have been communicated to this establishment by the Secretary of State for the Colonies:—

Badagry, 15th April 1888.

In nearly all the native villages in the western district of the Colony of Lagos, and, I believe, throughout the colony and interior, are to be found large spreading trees, which have been planted for shade in the market places, streets, and compounds. These trees are of the fig family, and are called by the natives *Abba.*

I have measured a tree of this species of the age of 13 years, and found its girth, at 3 feet from the ground, to be 6 feet 4 inches, and its height to the branches 12 feet, while its total height could not be less than 50 or 60 feet, and its foliage area a quarter of an acre. A tree of this size ought to give large quantities of milk if tapped at the right time of the year. Although it was in fruit when I tapped it, and the season being very dry, was in every respect unsuitable, yet the milk exuded in large drops, and flowed for a considerable distance down the trunk. Three quarts of milk were extracted from this tree without injuring it in any way, and I have little doubt that at any time between the months of July and February from four to five gallons could have been obtained with but little trouble. The trees, however, should only be tapped on alternate years, so as to leave time for a fresh growth of bark to replace that which is removed. It is difficult to form an accurate estimate of the per-centage of dry rubber that would be yielded by a gallon of milk, but I have reason to believe from previous experiments on Central American rubber trees (*Castilloa elastica*) of similar richness of milk, that each gallon should give about three pounds of india-rubber. The value of the rubber produced depends largely upon the care with which it is prepared, and I have reason to believe that the milk of this species, at least, of the "Abba" tree, can be made to give an excellent sample.

Should the above facts be established, it becomes evident that plantations of the "Abba" tree would be a highly profitable investment. It is planted by the simple method of cutting off a branch and pushing it into the ground, and on account of the facility and rapidity with which it is raised, the natives used it largely for fence posts. From the trees already in full growth in the bush and towns a considerable export trade could be readily established, and careful planting would develop this trade to almost an unlimited extent.

The rubber gatherer has no need of expensive implements or heavy baggage when he goes into the bush to collect and prepare the milk. He should take half a dozen or more well-cleansed kerosine-oil tins. With these tins, a sharp cutlass, a few yards of strong cotton cloth, and a sieve made of doubled muslin fastened like a jelly bag to a round hoop, he has all that he absolutely requires for his work.

On reaching the tree to be tapped, deep incisions are made on one side only of the stem and branches. The milk, as it flows from the incisions, is directed into the collector's vessel by a small piece of tin which is inserted into the bark so as to serve as a spout.

When the day's work is done, the milk should be mixed with an equal quantity of pure rain water, and strained through the sieve into clean kerosine-oil tins, which have been well scalded so as to remove all traces of grease. The mixture should be left to stand, without being moved or shaken, for 36 hours. The milk will then have risen to the surface, and the water and impurities which have sunk can be drawn away through a small hole near the bottom of the tin, which has been stopped by a plug of wood. As soon as white particles are seen to pass through the hole with the water, the plug should be inserted, and the washed milk poured into the prepared tin, with the cotton-cloth bag inside.

The milk, having been poured into the bag until the tin is half full, should be left with the mouth of the bag well tied, and a square piece of wood lying on the top of it for 12 hours. A bag of sand weighing about 10 pounds may then be put on to the top of the piece of wood for another 12 hours. Quantities of discoloured water will be seen to flow from the perforations in the sides and bottom of the tin during this process, and on touching the top of the bag it will be found to offer some resistance to pressure.

A stout tree branch about 20 feet long should now be cut and trimmed, or if palm-leaf "bamboos" are obtainable, six or eight of them can be strongly lashed together. The pole thus obtained should have one end firmly fixed by thrusting it into a hole dug under a strong tree root, and a block of wood having been cut large enough to fit loosely into the tin, so as to rest on the square piece of wood which lies on the top of the bag of rubber, and to project above the mouth of the tin for about a foot; the tin and block should be thrust under the pole at the distance of perhaps a yard from the end which passes under the tree root. A large bag should now be filled with sand, and hung on to the pole. It is evident that the farther this bag is moved up the pole, the greater will be the pressure on the block of wood which acts as the fulcrum of the lever, and consequently upon the bag of rubber milk upon which it rests. Great pressure can be brought to bear by this simple means on the coagulating juice. Indeed, it will be found advisable to have the prepared tins replaced in their wooden case, and to press the milk in them side by side, by placing a flat board from block to block, and allowing the pole to rest upon that rather than directly upon the blocks. Unless some such precautions be taken, the tins will be apt to bulge, and perhaps burst outwards, when full pressure is applied.

The bag of sand should weigh about 100 pounds, and should be hung as near the tin as possible for 12 hours. It should then be moved along the pole gradually until it reaches the end farthest from the tin, where it should be left for two or three days.

On removing the weights and taking the bag out of the tin, which can be done by pressing the sides and lifting slowly, the mouth of the bag may be untied and the rubber removed, by turning the bag inside out. It will not be found to adhere to the cloth in the slightest degree, nor will there be any traces of viscosity in the rubber itself. It will appear as a white semi-elastic mass, which on exposure to the air will gradually turn black, and will gain in elasticity as it dries.

The samples when prepared should not be unnecessarily exposed to the sun, but will not be injured in any way by exposure to rain. They will, if anything, be improved by immersion in water.

The above method was followed when preparing the sample which I forward as Exhibit No. 1. At this season of the year it is difficult to obtain large enough quantities of milk for extensive experiments, and the specimens I am able to show are in consequence too small for commercial purposes. It is, however, my intention to continue the experiments on which these notes are based when the rains begin and the trees yield more sap. A further report will then be submitted should any new features present themselves.

Exhibits Nos. 2 and 3 are of unwashed milk coagulated by pressure, but as an insufficient weight was applied, they show a cellular structure, and are also not free from impurities.

Exhibits Nos. 4 and 5 are of shade-evaporated, unwashed milk, and are of fair quality. This method, however, cannot well be applied during the rainy season without the application of artificial heat, which I have proved to give unsatisfactory results.

Exhibits Nos. 2, 3, 4, and 5 are the results of preliminary experiments which were carried on with a view to proving the possibility of adopting, for the preparation of West African rubbers, the process described in notes already submitted to the Government of this Colony (see Government Gazette, Colony of Lagos, February 1888.)

Exhibit No. 1 shows that the method indicated has been to a certain extent successful, even under extremely adverse circumstances. It will, however, be for experts in England to point out the good and bad qualities of the samples, and to declare the price that it ought to command in the English market.

These notes have been strictly limited to the consideration of certain attempts to apply the method above described to the preparation of india-rubber from the juice of the "Abba" tree. There is now on hand a series of experiments on the "Ibo" vine juice, which may be further reported on when complete, but at present no results have been arrived at of sufficient definiteness to warrant a detailed report.

It is important to remember that the results here noted have been obtained from one series of experiments only, and are not to be considered as in any way final. They serve to prove the possibility of applying a simple and inexpensive system of preparation to African rubbers which has already produced good results elsewhere. It will always be a sincere pleasure to me to show what little I know about the subject to anybody who may be sufficiently interested by these suggestions to wish to apply them to the preparation of india-rubber for the European market, and any question addressed to me in writing will also meet with attention, and will be answered as fully as my slight knowledge of the matter may permit.

ALVAN MILLSON.

As it was the desire of the Government of Lagos to obtain an authoritative opinion upon the specimens of rubber prepared by Mr. Millson, the good offices were sought of Mr. S. W. Silver, F.L.S., who already has most obligingly assisted this establishment in the investigation of specimens of rubbers obtained from various sources. Mr. Silver was kind enough to forward the samples of "Abba" rubber to the India Rubber, Gutta Percha and Telegraph Works Company, Limited, at Silvertown.

The report received on the specimens is as follows:—

REPORT on FIVE SAMPLES of INDIA-RUBBER received from S. W. SILVER, Esq., 6th July 1888.

The samples are numbered in accordance with the report of Mr. Alvan Millson.

No. 1 internally was dark in colour, almost black, with a bluish fringe, tint gradually vanishing towards centre, which is nearly white. It was strongly alkaline in patches, evidently due to a little original moisture, other portions neutral.

No. 2, light (white) colour in centre, blackened about $\frac{1}{8}$ inch in depth, reddish fringe, very faintly acid.

No. 3, pink colour, blackened about $\frac{1}{8}$ inch in depth, contains much wood; slightly acid, especially in neighbourhood of woody particles.

Nos. 4 and 5. No. 5 is softer than No. 4, and lighter in colour; both samples have a pink tint and are distinctly alkaline.

Samples marked No. 1, No. 3, No. 4 were treated in detail; the quantity of the others being too small. Washing and drying, No. 1 lost 1·42 per cent. moisture, No. 3 lost 5 per cent., and No. 4 lost 7 per cent.

The temperature of the drying room was that used for the usual descriptions of rubber. If the samples had been hung up as usually adopted, the want of strength and firmness would have caused them to drop. Other means of drying would have to be devised. When dry No. 1 was very clammy, No. 3 was firmer than No. 1, but not nearly so good as No. 4. No. 4 might be more easily handled in drying.

They were all very short, with very little elasticity, this might have been expected from appearance of the original samples. They were kept in the drying room no longer than would be required if working on a practical scale.

Mixed with a suitable proportion of sulphur and vulcanised, they cured soft and short, but were not blistered. With pigments it may be made firmer and slightly tougher. It can evidently not be used by itself in any form. All the samples were troublesome to work in the mixing machines. It would not be right to assume that this behaviour is in any way a barrier to its usefulness.

When we take into account the great improvements which have been introduced in preparing certain African and Asiatic varieties of rubber, manufacturers must feel that the praiseworthy efforts of Mr. Alvan Millson to increase our sources of supply are in the right direction. Whether the recovery of the rubber from the "Abba" tree in the way these samples have been prepared is such as to ensure the best product in a commercial sense, is a most important matter. The sap of a tree may contain a large quantity of caoutchouc, but the same may be associated with other principles contained in the same or other plant tissues, which completely modify its character. It is this consideration which would lead one to ask how far the treatment of the juice of the *Castilloa elastica* can be applied to another plant, the juice of which, though containing caoutchouc, has very marked chemical differences.

I am not aware of any native india-rubber with an acid reaction; even the juice of the Para rubber tree, *Hevea brasiliensis*, is distinctly alkaline when drawn, and exhales a strong smell of ammonia. The rubber from this source is strongly acid. In roasting the nuts of the Urucari palms, a large quantity of acetic acid is given off, which probably, by neutralizing the ammonia, brings about the coagulation of the caoutchouc, the excess of acid from the roasting of the nuts may help to explain the acid reaction of the Para rubber, but as the negrohead variety is obtained from the same source, and is *not* smoked although it is strongly acid, we must consider the generation of acid as due to fermentation, at least in a very great measure. The samples obtained from the "Abba" tree are not acid, but whether the product could be improved by precipitation with ordinary crude acetic acid, which at the same time would arrest those changes which are liable to go on afterwards, to the detriment, probably, of the rubber, is worth finding out. I thought it would be important to ascertain whether the soft clammy condition of the samples was due to oxidation, or to the presence of resinous matter. A white pulverulent resin was obtained from sample No. 4, amounting to 24·48 per cent. of its weight. The caoutchouc, by destructive distillation, yelded caoutchucene and the other products obtained from india-rubber. When resins exist in the juices of india-rubber yielding plants, as a rule they are combined with water, as hydrates, which is fatal to their use for vulcanizing, since such rubber blisters when cured. On boiling the resin with caustic potash, a large quantity of ammonia was given off. In the present case, although such a large quantity of resin is present, the rubber cures quite solid, but soft and short, this may be due to the resinous matter. The oxidation of the rubber itself will not account for it. The rubber may be hardened by pigments, but its strength is still very low. It can be mixed with other low class rubbers with a corresponding improvement in toughness and strength.

In a locality so favourable for the growth of india-rubber producing plants, it would be interesting to know, whether any of the plants yielding good descriptions of rubber could be acclimatised successfully without invalidating the product. Common alum is sometimes found in the Para rubber, being used as a medium for coagulating, perhaps it may be useful in the present case.

I was informed by a friend who spent some time in Africa, that a very large quantity of crude acetic acid was shipped to different parts on the East Coast some years ago, and was evidently used in preparing india-rubber.

In smoking india-rubber, any plant may be used which yields acetic acid, but any plant yielding turpentine or similar products should be avoided.

The preservative action of the crude acid is enhanced by creosote and tarry matter present. Para rubber is flavoured with these.

While forming a favourable opinion of this gum, we cannot fix a value upon it, as everything will depend upon how far the experimental working can be verified in working on a larger quantity. As a supply of this is at present available, we would suggest that a larger quantity be sent over, say 100 pounds, so that we could test it in a practical manner, and thus give a better opinion as to its commercial value. We may observe that it is always more difficult to give a fair result on such small quantities, and it is therefore the more important that a supply sufficient for practical use should be sent.

India Rubber, Gutta Percha, and
Telegraph Works Co. (Limited),
Silvertown.

The results of the inquiry and the suggestions offered by this establishment are contained in the following letter addressed to the Colonial Office for communication to the Government of Lagos:

Royal Gardens, Kew, to Colonial Office.

Royal Gardens, Kew,
September 11, 1888.

Sir,

I am desired by Mr. Thiselton Dyer to acknowledge the receipt of your letter of the 16th June last forwarding papers and specimens from the Government of Lagos, relative to some experiments which had been made by Mr. A. Millson on the preparation of rubber from the Abba tree.

From the botanical specimens forwarded by Mr. Millson, Professor Oliver has arrived at the conclusion that this particular "Abba" tree is probably *Ficus Vogelii*, Miq., a West African rubber tree first collected by Vogel at Grand Bassa. This determination, however, owing to the character of the specimens, is not quite conclusive. It is very desirable that a full set of material be sent in all cases of this kind, which should contain young terminal shoots, as well as, portions of the branches, leaves, flowers, and fruits.

The various samples of rubber as received were forwarded, through S. W. Silver, Esq., F.L.S., to the India Rubber, Gutta Percha, and Telegraph Company (Limited) at Silvertown. The samples have received a very careful and exhaustive examination at their hands, and we have received from Mr. Silver a full report, a copy of which is herewith enclosed.

It is necessary in the first place to point out that rubber from the Abba tree similar to that under notice has already been investigated at this establishment. In the Kew Report for the year 1878, p. 39, a notice appears of Liberian rubber, which was identified with *Ficus* (Urostigma) *Vogelii*. This rubber, a sample of which is in the Kew Museums (from Mr. Thomas Christy) is made up into balls about the size of a large orange. It was valued (in 1878) at 1*s*. 6*d*. per pound, but it is added that "if sent home cleaner it would command a higher price."

It will be noticed that in the report furnished by the India Rubber, Gutta Percha, and Telegraph Works Company it is stated that the specimens received from Mr. Millson show an alkaline reaction and that on this and other grounds, such as the presence of resin and its soft clammy condition, "it can evidently not be used by itself in any form."

Mr. Millson's experiments are evidently based on his knowledge and experience of Central American rubber the produce of *Castilloa elastica*. It is probable, however, that the treatment suitable to the juice of this plant cannot be applied to another plant the juice of which, although containing caoutchouc, has very marked chemical differences.

The result of the inquiry so carefully conducted by the India Rubber Company would appear to show that the juice of *Ficus Vogelii* does not lend itself satisfactorily to such treatment. It is said that the rubber hitherto prepared from this tree has been treated with acetic acid, and, if this is the case, possibly in this direction may be found a solution of the problems involved.

It is desirable in any future experiments carried on with india-rubber on the West Coast that larger samples be forwarded to this country for the purpose of testing the quality. In the report it is stated that about 100 pounds is necessary to test rubber in a thoroughly practical manner.

In order to afford every information to the Government of Lagos in its praiseworthy efforts to develop the rubber industry of the Colony there is forwarded herewith a parcel containing samples of "Abba" rubber in different stages of manufacture, together with specimens of commercial Para* and Accra rubbers now in large demand in this country.

If the experiments are continued, as it is hoped they will be, and if the valuable suggestions contained in the report are carefully carried out, it is pretty clear that Mr. Millson will be able to discover a practical and efficient method of preparing the juice of the Abba tree so as to produce commercial rubber.

There are few subjects at the present time of greater importance than a careful investigation of caoutchouc plants, and the extensive distribution of Abba trees in West Africa indicates a wide and useful field of inquiry.

I am, &c.
(Signed) D. MORRIS.

Sir R. G. W. Herbert, K.C.B.,
Colonial Office.

Mr. ALVAN MILLSON to ROYAL GARDENS, Kew.

Badagry, West Africa, August 16, 1888.

YOUR letter of the 4th ultimo reached me yesterday. I regret that the samples of rubber sent by me were—owing to the difficulty of obtaining pure milk—both small and of inferior quality to those which have since been made. I was sorry also not to have had an opportunity of correcting the notes for the press, as I notice several misprints in them.

---

* Para rubber is yielded by *Hevea brasiliensis* and Accra rubber by *Landolphia owariensis*.

You were correct in your belief that the name "Abba" is applied to all arboreous fig-trees in this neighbourhood. Of these there is a remarkable variety. I will at a later date send specimens prepared as you so kindly direct me.

An enterprising firm of Lagos merchants, who have lately established a branch house in Badagry, have made a fair beginning in the rubber business.

So far as I can at present see West African rubber will never be reliable so long as the natives have the preparation in their own hands. The milk bears transport well, keeps well, and can easily be tested, by letting a sample (mixed with water) stand for twelve hours in a glass vessel. Unless merchants employ reliable men to buy and coagulate the milk, I fear that the trade will be of a very ephemeral nature. Yet on the other hand it seems clear, from the large numbers of rubber-giving fig-trees, that a properly conducted trade would be a considerable source of future prosperity to the whole coast. The present palm oil and kernel trade may be said to depend upon the continuance of slavery, and is indeed in many ways an injury to the people.

The Governor of the Colony, with his usual insight, is encouraging cocoa-nut planting and other similar industries, which will do much to improve the general prosperity. He has already proved that the india-rubber industry is by no means the least important of these branches of commerce.

ALVAN MILLSON.

LXI.—LIBERIAN COFFEE AT THE STRAITS SETTLEMENTS.

(*Coffea liberica*, Bull.)

About 15 years ago the introduction of a new species of coffee, now known as *Coffea liberica*, to supplement *Coffea arabica* which had hitherto been exclusively cultivated, was looked upon with considerable interest. At that time the coffee plantations in Ceylon and India were threatened with partial, if not total, extinction by the prevalence of a fungoid pest known as the Ceylon coffee-leaf disease (*Hemileia vastatrix*). In the West Indies the once prosperous coffee plantations of Dominica, Jamaica, and Demerara had gradually been reduced owing to the attacks of the white fly (*Cemiostoma coffeellum*), the exhaustion of the soil, and the pressure of other, and for the time, more remunerative cultures. It was claimed that the new coffee was more hardy than the Arabian; that it could withstand, without injury, the attacks of insect and fungoid pests; and that it was suitable for cultivation at lower elevations and in localities more easily accessible as regards facilities for labour and transport.

The scientific discoverer of Liberian coffee appears to have been Afzelius. It was described and figured by Hiern in the Transactions of the Linnean Society. [Second Series, Bot. I., p. 171, t. XXIV.] It is also described by the same author in *Flora of Tropical Africa*, vol. III., p. 181.

Liberian or Monrovia coffee is a native of Upper and Lower Guinea, and was cultivated on the West Coast of Africa in several localities before it attracted any notice in Europe. It was first introduced as a cultivated plant into the Royal Gardens, Kew, in 1872. It was largely owing to the action of this establishment that Liberian coffee, within a short period, was widely distributed for experimental purposes throughout British possessions in the tropics.

Particulars respecting the distribution of Liberian coffee plants from Kew, and the early history of its culture in different parts of the world, are given in the Kew Reports every year from 1872 to 1882.

It is well known that the successful cultivation of Arabian coffee is restricted to hilly or mountainous districts, and that only in such districts will the produce attain its highest value. The Liberian coffee, on the other hand, being a native of the comparatively low hills of West Tropical Africa, is suited to hotter conditions than the Arabian coffee, and it can be successfully cultivated in districts quite unsuited to the latter. In this lies the chief merit of the new coffee.

As a commercial article Liberian coffee has not hitherto proved so valuable as was at one time supposed, and the cultivation, though widely distributed, has not become general in any part of the world. There are, doubtless, good reasons for this. It has been found, for instance, that the "cherries" of Liberian coffee do not become soft and pulpy when ripe, but remain hard and fibrous. Hence it has been found difficult to husk the beans, as the machinery found suitable for preparing Arabian coffee is not applicable to the Liberian coffee. Again the "parchment" skin in the latter is tough and woody, and the labour and percentage of waste entailed in "cleaning" is increased, while the actual market value is less. Probably, also, in the cultivation of Liberian coffee the localties selected for plantations have, in many cases, been subject to prolonged droughts, whereas the species evidently prefers a warm, moist climate with abundant rains well distributed through the year.

Should the present high price of coffee be maintained it is not unlikely that the cultivation of Liberian coffee will prove sufficiently remunerative to warrant further attention being paid to it.

We understand that in Java the Liberian coffee cherries are fermented before they are pulped. It is claimed that this process enables the coffee to be cleaned much more readily, and that the coffee ultimately produced is brighter in colour and of better quality.

This, if verified, is a fact of some importance to the growers of Liberian coffee.

We have been led to make the foregoing remarks and review the present position of Liberian coffee owing to a very fine sample of this coffee which lately reached us from Malacca, and upon which is based the following correspondence :—

Mr. R. Derry, Forest Department, Malacca, to Royal Gardens, Kew.

Malacca, 30 July, 1888.

I am sending you per steamship "Ajax" (Ocean Steam Ship Company) a small case containing two samples of Malacca-grown Liberian coffee. One sample has the parchment cleaned, and the other left on. So far, no Malacca coffee has been shipped to Europe. I should be glad to learn the value of the samples sent, and whether Malacca coffee would be likely to meet with a market at home.

R. Derry.

Messrs. Lewis and Peat to Royal Gardens, Kew.

5, Mincing Lane, E.C.,
September 15, 1888.

We are favoured with yours of the 12th instant with samples of coffee which we find as follows:—No. 1, very good, bold, clean Liberian, well prepared and the best we have seen, value about 75*s.* per cwt.; No. 2, in parchment, very hard and apparently overdried, colour and quality of bean very inferior to No. 1, probably owing to being overdried, value about 30*s.*, 35*s.* per cwt., if cleaned 55*s.*, 60*s.* per cwt. This coffee could be cleaned in London by the process described in our letter of the 17th April,* but we doubt if a machine that is used for ordinary coffees such as East Indian or West Indian would clean such hard coffee as No. 2 sample. We shall be able to give you more information later, as we have just received a consignment of similar coffee in the parchment from Johore, and it will have to be cleaned and sold and we shall have much pleasure in giving you the result.

Lewis and Peat.

Messrs. Lewis and Peat to Royal Gardens, Kew.

6, Mincing Lane, E.C.,
October 5, 1888.

Referring to ours of the 15th ultimo, re Liberian parchment coffee, Malacca, we beg to say the London cleaning of the same has not proved nearly so satisfactory in the result as the sample sent to us by you and cleaned abroad, upon which we reported, as ours turned out musty and very rough. We attribute the failure to the fact that the coffee was not properly dried, and that the parchment of this coarse coffee gets very hard and difficult to clean when left long before cleaning. We certainly think if such results can be attained on the other side, as shown by your sample from the Tan Hun Guan estate at Durian Tungal [Malacca] it would be folly to send the coffee home here in parchment. Our shipment consisted of 110 bags in the parchment and weighed 122 cwts. The out-turn after cleaning gave:—

35	bags	bold which sold	at 68*s.*	per cwt.
9	,,	medium	,, 60*s.*	,,
5	,,	peas	,, 70*s.*	,,
2	,,	triage	,, 45*s.*	,,

The loss in weight was 34 cent., which we consider excessive.

Lewis and Peat.

The large per-centage which the parchment of Liberian coffee bears to the clean beans, a fact which we have already noted, is fully borne out in the above trial.

The information contained in this correspondence will doubtless prove of considerable interest to growers of Liberian coffee, and may help to solve some of the difficulties which still hamper the industry.

If this trial is conclusive, it would appear that it is not desirable to ship Liberian coffee to this country either in the dried cherry or in the parchment. Owing to the large bulk of these coverings the coffee must be cleaned on the spot. It would be interesting to learn the particulars of methods, if any, which have successfully dealt with this problem.

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* See *Kew Bulletin*, No. 17 [May 1888], p. 132.

LXII.—TEA OIL AND CAKE.

(*Camellia Sasanqua*, Thunb.)

In the Annual Report of the Government Analyst of Hong Kong for the year 1887, attention is drawn to the use of a substance called *Ch'á tsai ping* for poisoning fish. This substance is said to be the residual cake of the seeds of *Camellia Sasanqua*, Thunb., after the oil is extracted. Its action on fish, due to the presence of a glucoside, giving most of the reactions of saponin, has already been known and described, amongst others, by McCullum (Pharm. Journ. (3), Vol. xiv., p. 21). It appears that the fish killed by the *Ch'á tsai ping* may be used as human food without any ill effects.

A complete set of the seeds of *Camellia Sasanqua* are in the Kew Museum from China and Japan, and a sample of the oil from Japan. A specimen of oil-cake, and a decoction of the same, as used in China for various purposes, are also in the Museum from Hong Kong.

In connexion with this subject, the following notes have been prepared by Mr. Charles Ford, F.L.S., Superintendent of the Botanical and Afforestation Department, Hong Kong. From these notes it would appear that *Ch'á tsai ping* might be turned to a useful purpose in destroying worms in soil in which pot plants are grown, and also in eradicating them from grass lawns.

Botanical Gardens, Hong Kong,
September 20, 1887.

In reply to your inquiries concerning the preparation and uses of *Ch'à tsai ping* (made from the seeds of *Camellia Sasanqua*), I have much pleasure in being able to furnish you with some information.

While on a botanical tour in the Kwangtung province, from which I have just returned, I had an opportunity of inspecting plantations of the shrub from which the material is obtained, of seeing mills in which the article is prepared, and of receiving information on both the cultivation of the plant and the preparation of *tea oil* from an intelligent and courteous old Chinese gentleman.

Camellia Sasanqua, Thunb., is extensively grown in South China for the production of seeds which yield a valuable oil known as *tea oil*. *Ch'à tsai ping* is the refuse matter left after the oil has been expressed. The preparation is very simple. The seeds are collected in October or November, dried and taken to a mill, where they are crushed in a circular mortar or trough by a pestle drive through it by water power. The seeds after being crushed are steamed, and then the mass is placed in a powerful press, which expresses the oil. The refuse, after the extraction of the oil, is the article known as *Ch'á tsai ping*. It is produced in cakes weighing, when dry, about 3 ozs. and 3½ lbs. respectively. The quality of the two kinds of cake is the same. I am not aware that anything besides the seeds of *Camellia Sasanqua* enters into the composition of these cakes.

Ch'á tsai ping is used by the Chinese as a hair wash, and as soap for cleansing both the person and clothes. It is also used for the eradication of earth-worms from the soil in which plants in pots are grown. In these gardens we also use it for eradicating earth-worms from grass lawns. For this purpose the cake is crushed and boiled. The decoction is then diluted and poured on the grass when the worms come to the surface of the ground. As a rule the small worms die, but the larger ones after a time recover. After being picked up from the grass the worms are often given to fowls and ducks, which devour them readily and apparently thrive on them, experiencing no inconvenience from the effects of the *Ch'á tsai ping* with which the worms were killed.

CHAS. FORD.

In *Index Floræ Sinensis*, Vol. I., p. 81, it is pointed out that *Camellia drupifera*, Lour., and *C. Sasanqua*, Thunb., are so closely allied that imperfect specimens are very difficult to determine. Mr. Ford's specimens of the former, collected in the Kwangtung province, may belong to the latter. A full synonymy of the species may be found in the *Index Floræ Sinensis* as above.

LXIII.—DEMERARA PINK ROOT.

(*Spigelia anthelmia*, L.)

We recently received from St. Vincent, West Indies, specimens of a plant which was represented "to be poisonous to cattle, sheep, and "goats, and to prove fatal in two or three hours." This plant was identified by Professor Oliver as *Spigelia anthelmia*, L. a member of the natural order *Loganiaceæ*, commonly distributed throughout the tropical parts of continental America and the West Indies. It is a glabrous annual, with two pairs of upper leaves so closely approximate that the plant somewhat resembles *Paris quadrifolia*. The flowers are small and tubular of a white and pink colour arranged in a unilateral scorpiod raceme. The fruit when ripe is purple.

This species is figured in Browne's Jamaica, t. 37, f. 3; in Tussac's *Flora Antillarum*, IV., t. 8, and in Descourtilz *Flore Médicale des Antilles*, I., t. 61. There is also a figure, a poor one, in the Botanical Magazine, t. 2359. In the latter publication it is stated that "*Spigelia* "*anthelmia* is a plant of considerable efficacy for the cure of worms "and febrile diseases, supposed to arise from the presence of worms. "It was first brought into notice by Dr. Patrick Browne in the Natural "History of Jamaica . . . . There can be no doubt this and the "allied *S. marilandica* are very efficacious remedies, but whether from "the unpleasant narcotic effects which they sometimes produce, "especially on the eyes, or some other cause, they seem now to be very "much neglected." In Bentley and Trimen Med. Plants, 180, it is stated that "the root and herb generally of *Spigelia anthelmia* is a "popular remedy in British Guiana as an anthelmintic. Its effect is "said to be even more certain and marked than that of the official "pink root (*S. marilandica*). Lunan in *Hortus Jamaicensis*, p. 306, describes *Spigelia anthelmia* as "a powerful vermifuge which "administered incautiously has proved fatal."

There can be no doubt that this plant possesses such drastic properties as may render it exceedingly dangerous as food for cattle and sheep that may be driven to feed upon it. We have no evidence heretofore, that animals have been actually killed by eating the leaves, but the fact is by no means an improbable one. The only practical remedy we can suggest is to keep pastures free from such plants and to destroy them wherever stock are likely to have access to them.

LXIV.—FOOD GRAINS OF INDIA (continued).

COIX GIGANTEA, ROXB.

In discussing a new variety of the ordinary Job's tears (*Coix Lachryma*, L.), it was mentioned in *Kew Bulletin* for June 1888, p. 144, that the fruit possessed little or no nutritive value in the wild state, and its use was restricted to a few aboriginal tribes in Eastern Bengal and Assam.

At that time we were aware that some cultivated plants of *Coix* yielded a comparatively nutritive grain, but their determination was by no means certain.

We have now obtained, on the suggestion of Sir Joseph Hooker, sufficient information to warrant us in drawing the conclusion that the cultivated *Coix* in the Khasia hills as also the cultivated *Coix* of Sikkim belongs not to *Coix Lachryma*, L., but to *Coix gigantea*, Roxb. This latter is a recognised species quite distinct from *C. Lachryma.*

Coix gigantea, Roxb. Fl. Ind. III., p. 570. According to Roxburgh the culms of this species are *perennial.* They are erect, branching to the top, round, smooth jointed, from 8 to 15 feet in height and as thick as a man's thumb at the base. The leaves are from 2 to 4 feet long and about 1 inch broad, *subcordate at the base;* the upper side and margin backwardly hispid. The sheaths are short and smooth. The spikes are numerous, pedicelled, and terminal. The male flowers above the female as in the genus, *but numerous and three fold;* the two lateral ones sessile, and the middle one pedicelled; they are *closely imbricated round the whole of the spike.* The involucre is ovate, entire round the circumference . . . smooth, glossy . . . . and [in the wild plants] exceedingly hard.

The portions of the above description in italics indicate the characters which separate this species from *C. Lachryma.* Other points of distinction are to be found in the generally larger size of the plants; in the absence of spathes to the pedicels; and in the pedicels not being jointed (*i.e.* the fruit is persistent). The chief character of *C. gigantea* as distinguished from *C. Lachryma* is, however, to be found in the male flowers. These are arranged in groups of three, the two lateral being sessile, while the middle one is pedicelled. In *C. Lachryma* the male flowers are few in number arranged loosely in the spike and always in pairs,—one sessile and the other pedicelled. The male flowers in *C. gigantea* are numerous, and closely inbricated in a spike nearly twice as long as in *C. Lachryma.*

Roxburgh gives the habitat of *C. gigantea* "chiefly in the valleys "amongst the Circar mountains and in Bengal." There are specimens in the Kew Herbarium from East Bengal (Griffith); from Syong in the Khasia Hills (Hooker and Thomson, 1850), marked "the usual cultivated cereal;" from Sikkim, 4,000 feet, wild plants and also specimen marked "cultivated;" from Mysore, Carnatic, and Malabar (Stocks and Law); and from Gangetic Plain (Duthie, 1885).

This species is not mentioned as cultivated either by Roxburgh or Griffith. In most works on economic botany the use of the grain of *Coix* is exclusively associated with *C. Lachryma.* This is doubtless an error of identification. We have no evidence that *C. Lachryma* is cultivated for the sake of the grain, although, as in the Naga Hills, Assam, and in N.W. Luzon, Philippines (*fide* Vidal), the grain is gathered from wild plants and eaten. In Sir Joseph Hooker's *Himalayan Journals*, vol. ii., pp. 289 and 313, it is stated that "a good deal of *Coix* is cultivated in the Khasia Hills; the shell of the cultivated sort is soft and the kernel is sweet, whereas the wild *Coix* is so hard that it cannot be broken by the teeth; each plant branches two or three times from the base, and from seven to nine plants grow in each square yard of soil; the produce is small, not above 30 or 40 fold."

The specimens collected by Sir Joseph Hooker when in Khasia, which are now in the Kew Herbarium, show that the cultivated *Coix* of this district is *C. gigantea*. So also is the cultivated *Coix* of Sikkim.

Dr. Smith, quoted in the *Catalogue of the Vienna Exhibition*, 1873, speaks of the grain of *Coix* (a description which exactly suits this species): "as larger and coarser than pearl barley, but is equally good for making gruel. As it is sold for 5*d.* per Chinese pound it makes an excellent diet drink for hospital patients in China." Further, in Mason's Burmah, under Coix Millet, p. 476, it is stated that a species of *Coix* with large esculent seeds, known as *Kalepoukpouk*, which are treated like Indian corn, are often for sale in the bazaars, and are cultivated very extensively by the Red Karens.

In order to supplement the information contained in the FOOD GRAINS OF INDIA, Professor Church, F.R.S., has been good enough to analyse a sample of the cultivated grain of *C. gigantea* in the Kew Museum (marked 182—1886). This was obtained from the Indian Court at the Colonial and Indian Exhibition. The following is the Report kindly furnished by Professor Church:—

Coix gigantea, Roxb.

In the sample submitted to analysis it was found that each fruit after removal of the involucre weighed on the average no less than 1½ grains. From four parts by weight of the sample three parts of husked grain were obtained,—three times the quantity yielded by *Coix Lachryma*.

Composition (in 100 parts).	
Water	14·8
*Albuminoids	16·8
Starch, &c.	59·9
Oil	5·8
Fibre	0·9
Ash	1·8

The "nutrient-ratio," or proportion of albuminoids to starch plus oil converted into its starch-equivalent, is here 1 : 4·4; the total nutrient value is 90.

The quantity of albuminoids in these husked seeds is remarkable; it approaches the per-centage found in some kinds of pulse. The nutrient value is high; and the proportion of oil or fat is larger than that present in the great majority of cereals. Speaking generally, the results of the present analysis correspond very closely with those obtained in the analysis of *Coix Lachryma* (FOOD GRAINS OF INDIA, p. 60).

A. H. C.

The practical point brought out in this analysis is that the cultivated plants of *C. gigantea* yield 75 per cent. of clean grain, whereas the wild plants of *C. Lachryma*, with which they have hitherto been confused yield only 25 per cent. of clean grain. In both species the chemical composition of the grain is remarkable for the quantity of albuminoids it contains, and if the soft-shelled cultivated form of *C. gigantea* was more prominently brought into notice, it might prove a much more valuable cereal than many now in use in various parts of the tropics.

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* Containing 2·66 nitrogen.

LXV.—YORUBA INDIGO.

(*Lonchocarpus cyanescens*, Benth.)

With Plate.

In the *Kew Bulletin* for March 1888, p. 75, will be found a summary of information respecting African indigo plants, with especial regard to what is known as Yoruba indigo. For more than 30 years, since Barter first brought back specimens from the Niger expedition, the exact determination of the plant yielding Yoruba indigo has been keenly sought. Plants were raised from seed sent to Kew by Captain Moloney, C.M.G., and one of these plants sent to Ceylon had recently flowered and fruited in the Botanic Gardens at Peradeniya. From specimens obligingly communicated to us by Dr. Trimen, F.R.S., we are enabled, by the courtesy of the Bentham Trustees, to give a drawing of the plant with a brief description by Professor Oliver taken from the forthcoming part of the *Icones Plantarum.*

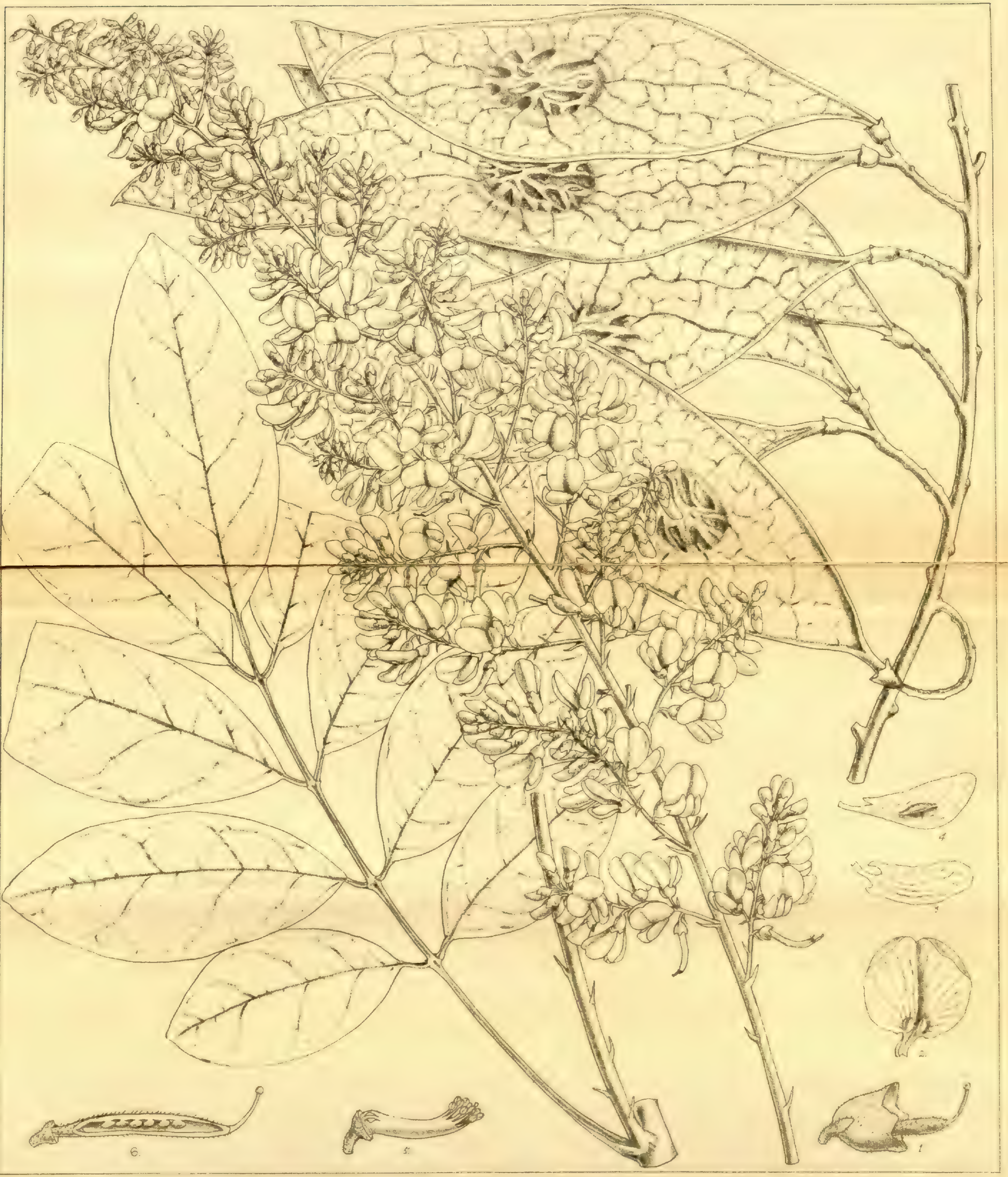
Lonchocarpus cyanescens, Bentham in *Journ. Linn. Soc.*, IV. (*Suppl.*) 96: a shrub of twining habit, belonging to the tribe *Dalbergieæ* of the Natural Order *Leguminosæ.* Stem often 20 to 30 feet long, the branches glabrous or slightly silky. Petioles firm, woody, 2–3 inches long; leaflets, 9–13, oblong, 3–5 inches long, pointed, the base rounded, the lower ones shorter, coriaceous, upper side smooth, lower side minutely pubescent. Flowers in copious often fascicled panicles, sometimes a foot long, the branches short, spreading, densely flowered but not fascicled. Bracts lanceolate, subulate, deciduous, equalling the pedicels, one line long. Calyx finely grey-silky, the teeth deltoid. Corolla three times as long as the calyx, violet. Pod 4 to 8 and sometimes 10 inches long, 1—1¼ inches wide, narrowed at both ends, stalked, cartaceous strongly reticulated.—Baker in Oliver Flora Trop. Africa, ii. 243; Robinia cyanescens, Schum. et Thonn., Guin. Plant. 351.

The habitat is given as West Tropical Africa: Niger (Nupe), *Barter;* Lagos, *Rev. J. B. Wood;* Fernando Po, *Mann;* Gold Coast, *Capt. Moloney;* and perhaps the same from Senegambia and Sierra Leone.

Professor Oliver states: "This species is the indigo of the " Yoruba country, a region north of Abbeokuta, and goes by the name " of 'Yoruba Indigo.' Mr. Bentham was the first to identify our " plant with Schumacher and Thonning's *Robinia*, the specific name " of which he of course took up under its present genus. I cannot be " quite certain however of this identity, S. and T. describing the pods " of their plant as pubescent, whilst ours even immature are glabrous, " and they omit all reference to the conspicuous reticulation of the " pericarp."

Barter's manuscript note on the specimens sent by him to this country in 1859 is as follows:—

"Indigo of the Yoruba country. Leguminous shrub of twining habit and large growth. Flowers in loose panicles, at first pink changing to



M. S. del. et lith.

Lonchocarpus cyanescens, Benth.

a faded blue. Common near rivers; plantations of several hundred acres of this are about Abbeokuta. In cultivation the plant is kept about 7 or 8 feet high; long shoots are cut close, and it becomes short and spurred and bushy, like *Wistaria sinensis* when similarly treated. The leaves are gathered young (as seen in the specimen), merely powdered in a mortar into a black pasty state, made into balls the size of double fists, and dried for the markets. In dyeing, one ball to a gallon of water is used; the cloth allowed to remain four days. The dye is fixed with potash; a fine deep blue is produced, very permanent."

In recent years we are entirely indebted to Captain Moloney, C.M.G., Governor of Lagos, for specimens of the plant and ultimately for the seeds which have been the means of affording us a scientific determination of the species.

Selected specimens of Yoruba indigo were brought to this country by Captain Moloney in 1883, and a portion of these were submitted to Dr. Hugo Müller, F.R.S., who is well acquainted with the commercial value of indigo samples. Yoruba indigo was worth from 4*s.* to 4*s.* 6*d.* per lb., as compared with fine Bengal, which is worth from 7*s.* to 7*s.* 6*d.* per lb. It contained, however, a good deal of earthy matter; and if this could be eliminated in the manufacture, it would, of course, be worth more. [Thiselton Dyer in *Journ. Linn. Soc.*, vol. xx. p. 404.]

It is needless to point out that the ordinary indigo of commerce is obtained from two or three species of Indigofera (*I. Anil.*, *I. tinctoria*, &c.). It is imported to this country chiefly from India, Philippine Islands, and Central America. Of the total imports (in 1887) of 76,700 cwts. of the value of 1,673,067*l.*, more than 68,000 cwts. came from India.

Other plants yielding indigo or a colouring matter similar to true indigo are: *Isatis tinctoria*, L., the well-known Woad; *Polygonum tinctorium*, Lour., which furnishes Chinese or Manchurian indigo; *Strobilanthes flaccidifolius*, Nees, furnishing the Room or Maigyee dye of Assam and South China; *Wrightia tinctoria*, R. Br., used in India; *Tephrosia tinctoria*, Pers., used in Mysore; and *Marsdenia tinctoria*, R. Br., in Burma and Sumatra.

LXVI.—TRINIDAD IPECACUANHA.

(*Cephaelis tomentosa*, W.)

It is well known that the demand for the officinal Ipecacuanha* is steadily increasing, while the supply of the drug is either stationary or gradually becoming scarcer. Inquiry is therefore naturally directed to plants that may possess similar properties in the hope that they may serve to supplement or replace the drug hitherto exclusively in use. As a case in point, we find that the bark of *Sycocarpus Rusbyi*, Britton, known in Bolivia as Cocillaña, is in course of being investigated, "because it contains a strongly active principle, somewhat "relating to emetine as to its physiological action," and in the hope that "the close resemblance of its properties to those of ipecacuanha will

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* A note on the officinal Ipecacuanha (*Cephaelis Ipecacuanha*, Rich.) was given in the *Kew Bulletin* for the month of May last, p. 123. In this note the introduction and successful cultivation of this valuable plant in the East Indies were fully discussed.

" qualify it to replace to some extent that drug which has now become
" so scarce and high."

A short time ago we received from Mr. J. H. Hart, F.L.S., Superintendent of the Botanic Gardens at Trinidad, specimens of the roots and leaves of *Cephaelis tomentosa*, W. He found these were in use in Trinidad as an emetic, and hoped that their physiological action might be due to the same principle as that existing in the true Ipecacuanha.

The plant is a tall shrub, with the younger parts of the stem and leaves covered with a shaggy tomentum. The leaves are elliptical, or elliptical oblong, acute. The stipules are prominent, two on each side, and long acuminate. The flower heads are terminal with two purple-red bracts. The latter remain revolute on two sides, exposing the flower heads. The individual flowers are yellow, while the ripe fruit is succulent and pale blue in colour. An old drawing of this plant, not very good, appears in Aublet *Plantes de la Guiane Françoise*, t. 61. A more recent drawing appeared in the Botanical Magazine, t. 6696, from a plant grown by Messrs. Veitch at Chelsea. The species is described "as a very singular plant, congeneric with that yielding
" medicinal Ipecacuanha, but of very different appearance, a native of
" tropical America, where it extends from Mexico through British
" Honduras, Nicaragua, United States of Columbia, British Guiana,
" to equatorial Brazil on the east, and to Peru on the west side of the
" Andes. It is found in Trinidad, but in no other of the West India
" Islands."

The specimens of stems and roots (but apparently not the leaves) forwarded by Mr. Hart have recently been investigated by Mr. Francis Ransom and a note giving his results was read before the Pharmaceutical Conference held at Bath in September last.

It was found that traces of an alkaloid were present resembling emetine, but the quantity was so inappreciable that the plant could not be utilized commercially as a source of Ipecacuanha. The summary of Mr. Ransom's paper, as it appeared in the *Pharmaceutical Journal*, [3], vol. xix., p. 187, is as follows:—

"Mr. Ransom read a note on the examination of the root and stem of *Cephaelis tomentosa*, said to be used in Trinidad for the same purposes as the root of *C. Ipecacuanha*, though the root is totally unlike that drug, both in external appearance and internal structure. The presence was ascertained of traces of an alkaloid which gave a reaction with mercuric chloride resembling that of emetine. But as the physiological action of 60 grains of the root was inappreciable, the amount of alkaloid present must be very small."

LXVII.—TREATMENT OF VINES IN FRANCE.

The Foreign Office has communicated the following letter addressed to Her Majesty's Ambassador at Paris by Mr. J. A. Crowe, C.B., Commercial Attaché for Europe, respecting the present condition of the Vine-culture in France:—

My Lord, Paris, October 18th, 1888.

In August last Mr. Viette, Minister of Agriculture, paid a visit to the wine-growing districts of France; and he is understood to have returned with a very hopeful report on the prospects of this year's vintage. The points to which the Minister gave special attention were grafting on American vines, submersion, the cure of phylloxera by sulphide and sulpho-carbonate of potassium, and the destruction of black rot and mildew by what is known as the "Bouillie Bordelaise."* The methods of grafting are described as having been perfected and successfully extended in the Médoc and the department of the Hérault and Gard.

On the 17th instant Mr. Viette communicated to his colleagues and to the press the substance of the information he has received respecting the vine crop.

The old area of vineyards has, it appears, been almost entirely replanted in the Hérault and Gard. The total yield of wine for 1888 is forty million hectolitres, or 77,000,000 gallons as against thirty-four million hectolitres or 68,000,000 gallons in 1887. In the Hérault the vintage was 3,500,000 hectol. last year, and 8,000,000 this year. The Gard yields this season 6,000,000, the Gironde, 2,500,000 hectol.

Nothing is said in these reports of the quality of the wine. The accounts I have had from departments less to the south than those above noted are not very favourable as to the ripeness of the grape or the sweetness of them.

I have, &c.
(Signed) J. A. Crowe.

LXVIII.—HUSKLESS BARLEY.

In 1884 Mr. Duthie, Superintendent of the Government Botanical Gardens, Sahāranpur, brought to England and presented to the Kew Museum "a remarkable variety of loose-grained barley of a dark colour, " grown from a small sample exhibited at a previous agricultural show " at Sahāranpur by a Zamindar of the Muzaffarnagar District." Messrs. MacDougall Brothers were so good as to give the following report upon a portion of the sample :—

Millwall Docks. July 19, 1884.

We have much pleasure in receiving your letter of 11th instant with samples of wheat and barley. I have shown them to most of the principal people in the corn market, who took much interest in them.

The barley was looked at with much interest and many opinions expressed upon its being quite new ; the value varied from 23*s.* to 30*s.* per 400 lbs.

I notice on damping it that each grain sprouts well and so will malt, but the colour comes off and so would not do (it is thought) for pale ales, but it would do well for stout. For feeding purposes it would be useful, although it would take time to remove prejudice to its colour. Is this seed likely to grow better than the ordinary barley, or is it possible to grow a huskless barley of the ordinary colour ?

I am much obliged to you for sending these samples, which are so very interesting, and shall always be pleased to give you any information in my power.

I am, &c.
John McDougall.

---

* *Bouillie Bordelaise* is a name applied to a special mixture used in France for the treatment of mildew in vines. It is composed of water 100 litres, sulphate of copper 3 kilos., and lime 1 litre.

Mr. Duthie gave the following additional information in his report for the year ending March 31, 1885 :—

"The chocolate-coloured barley produced 15 maunds grain and 12½ maunds straw per acre. The yield of grain was thus heavier than the yield of straw. The objection as to colour, alluded to in the report, is fatal to its value, and will prevent its even being grown, except as a curiosity; we possess a white-grained variety of huskless barley, and a good large sample of this has lately been sent to Kew for special report. The huskless barleys appear to be quite unknown in England, and as everything except colour was favourably commended, as in the case of the variety sent, I am in hopes that the report on the whole variety will be altogether favourable, and perhaps become the means of bringing this barley to the notice of the English market."

This sample was duly received, and was submitted to Messrs. MacDougall Brothers. They stated that the white huskless barley was looked upon in the London market with very great interest, and would, they thought, be of very considerable value. The sample was, however, very much weevilled, and it was hardly possible to pick out a sound grain. Messrs. MacDougall, however, thought that if it was possible to send this barley in a sound condition, it would command a ready sale at a high price. With regard to the origin of these curious cereals, a communication was read from Captain Pogson at the meeting of the Agricultural and Horticultural Society of India on January 29, 1886, in which it was stated that Indian wheat-barley, as he termed it, was introduced into the Punjab and North-western Provinces during 1881, when considerable success was secured in the Punjab. He further stated that the seed was obtained from Poo in Thibet. Three varieties of huskless barley are largely cultivated in Thibet, namely, the white, the dull green, and the dark brown (chocolate-coloured).

There is nothing further to record about this huskless barley till the present year, when the specimens in the Kew Museum attracted the attention of Mr. Horace T. Brown, of Burton-on-Trent, who has communicated the following interesting observations, which he has kindly allowed to be published :—

Mr. Horace T. Brown to Royal Gardens, Kew.

47, High Street, Burton-on-Trent, June 22, 1888.

The samples of "skinless" barley which your Assistant Curator was good enough to give me have turned out of considerable interest. Of the two from Sahárunpur the *black* sample only was capable of germination. I find, on making sections of this barley, that the stain, which is of a dark purple, resides almost wholly in the *testa*, especially in the neighbourhood of the ventral "furrow," the *pericarp* being quite uncoloured.

Owing to this natural staining process, the differentiation of the two envelopes of the caryopsis is far more evident than is usually the case.

It would be of interest to know if the paleæ of this barley, none of which are included in the sample, are also coloured, as is the case with the paleæ of black oats.

In the black Sahárunpur barley the plumula grows normally along the *mesocarp*, but as it thickens at the base during growth the pericarp is ruptured, and the tearing sometimes extends half way along the grain. This would militate considerably against its value as a malting grain since the embryo would be very liable to be separated during the turning of the grain.

The sample of white skinless barley from Kotgahr, which, by-the-bye, germinates well, is almost free from this defect, owing to the pericarp being somewhat stronger. The black Sahárunpur barley consequently stands, in this particular, intermediate between ordinary barley and wheat, where the pericarp is so thin that the plumula bursts through it at once, instead of progressing along its normal path in the mesocarp.

In wheat this is evidently a peculiarity brought about by cultivation, for I have found in wheat the same marking out of the normal course of the plumula as in barley, as indicated by the slight tendency of the pericarp to separate in its meso-coating along the dorsal longitudinal line which the plumula ought to take. We must, I think, conclude from this that in *primitive wheat* the pericarp was strong enough, either by itself, or by the aid of the paleæ, which may then have been adherent, of retaining the plumula until it may its way out at the point of the grain. There are several manifest advantages in this which have been lost by the selection of thin-skinned varieties.

I am not aware of any varieties of wheat where the plumula is retained in the pericarp, but there may possibly be such, and I should imagine that in this case they would be related more closely to the parent stock than our ordinary varieties.

If you could get for me any fresh samples of naked Indian barley I should esteem it a favour. One would like to know something about the nature of the colouring matter of black barley.

Captain Pogson in his *Manual of Agriculture for India*, 1883, pp. 120–125, has given fuller details with respect to the introduction of huskless barley into India. *Duthie and Fuller, Field and Garden Crops of N.W. Provinces and Oudh* (*Sub.* Tab. 2) identify it with *Hordeum gymnodistichon*. The Kew Herbarium contains a specimen collected at Kyunglung, Tibet, alt. 14,000 ft., by Lieut.-Gen. Strachey, C.S.I., of a 4-rowed barley with the name *Hordeum cœleste*, Viborg.

LXIX.—RAMIE.

The subject of the utilization of the Ramie plant (*Boehmeria nivea*, Hk.) is one which has been closely followed at Kew for many years. The importance of the subject in India and the Colonies has led to considerable correspondence being addressed to this establishment. Specimens of Ramie stems, grown at Kew, have been supplied, as far as practicable, for experimental purposes in this country and in the *Bulletin* for June 1888, pp. 145–149, we gave a summary of information on the subject.

Recently the French Government undertook a series of trials of methods for preparing Ramie fibre, and in behalf of the India Office, Mr. D. Morris, F.L.S., the Assistant Director, was appointed to attend these trials and prepare a report of the results. This report, with the permission of the India Office, is reproduced below :—

Kew, October 24, 1888.

In the French *Journal Officiel* of the 13th of April last there appeared a ministerial order approving an International Competition of Methods (mechanical and chemical) for preparing the fibre of the Ramie plant. The order was based on the fact that considerable interest was taken in the cultivation of the Ramie plant in Algeria and French Colonies generally, and that it was a matter of national importance to solve the problem of preparing Ramie fibre so as to bring it within the reach of commercial enterprise.

The competition was, in the first instance, fixed for the 15th August, but it was afterwards postponed to the 25th September on account of the unfavourable season which had been experienced for the growth of the Ramie plant intended to be used in the trials.

IMPORTANCE OF THE RAMIE QUESTION.

It is well known that the production of the fibre of Ramie in commercial quantities, and in an economical and remunerative manner, has constituted one of the most important industrial problems of the present day. It has been keenly followed in nearly every part of the world; but the chief efforts hitherto made have been confined to India, to the West Indian Colonies, to the United States, and more recently to France and her Colonies.

The Government of India, nearly 20 years ago, was led to offer a reward of 5,000*l.* for the best method for preparing Ramie fibre and presenting it in a suitable condition for textile purposes. It was led to this step by the conviction that the only obstacle to the development in India of an extensive trade in Ramie fibre was the want of suitable means for decorticating the plant. This was the third time that Ramie had become the subject of official action. The first effort for utilising this plant was in 1803, when Dr. Roxburgh started the question; the second was in 1840, when attention was directed to it by Colonel Jenkins. The offer of 5,000*l.* in 1869 induced many competitors to enter their names, but it was found that no machine fully fulfilled the conditions laid down by the Government, and therefore the full prize was not awarded. Other unsuccessful attempts were subsequently made, and eventually the offer of 5,000*l.* was withdrawn.

Since that time many thousands of pounds have been spent upon the Ramie plant, and the aid has been invoked of both mechanical and chemical science to solve the problem connected with decorticating the fibre. Many processes have been brought forward from time to time, and it was claimed for each of them that they had fully realized the hopes of their inventors. But promising as some of these processes were, they do not appear to have been introduced into regular use, and only one or two have at all come into prominence.

Naturally the earlier attempts to prepare Ramie fibre had followed the methods already in use in preparing flax, hemp, and jute; but it was soon evident that as regards Ramie these methods were useless. The fact that the fibre of the Ramie plant is embedded in a gummy matter offered the greatest obstacle to the production of clean and bright threads suitable for the spinner.

ARRANGEMENTS FOR PARIS TRIALS.

The *Concours International de la Ramie,* recently held at Paris, took place in one of the annexes of the proposed exhibition of 1889 on the Quai d'Orsay (Place de l'Alma). It was attended by representatives from all parts of the world.

It was evident that the proceedings were watched with considerable interest by inventors, no less than by persons directly interested in the cultivation of the Ramie plant. Very complete arrangements had been made beforehand by the French Ministry of Agriculture. Steam power was provided and a large supply of green stems (of the species *Boehmeria nivea*) had been grown in the neighbourhood of Paris ready for the trials. Dried stems had been obtained from Algiers, while to test the chemical processes, a quantity of Ramie ribbons were available ready to be converted into filasse.

The commission of jurors included M. Tisserand, Councillor of State and Director of Agriculture, a number of prominent engineers, chemists and botanists (including the Professeur de Culture of the *Jardin des Plantes*), and the Director of Agriculture in Algiers. They were evidently men who were acquainted with the economical problems connected with the cultivation and utilization of the Ramie plant, and the trials were conducted in a systematic and exhaustive manner.

LIST OF PRIZES OFFERED.

Prizes had been offered by the French Government in the following five categories:—(*a.*) For a machine to decorticate Ramie in a green state, driven by steam power, 1st prize 1,000 fr., 2nd prize 700 fr.; (*b.*) For a machine to decorticate Ramie in a dry state, driven by steam power, 1st prize 1,000 fr., 2nd prize 700 fr.; (*c.*) For a machine of a light and portable character driven by horse power, and suitable for use in the Colonies, 1st prize 700 fr., 2nd prize 500 fr.; (*d.*) For a hand-power machine of a light and portable character, suitable for use in the Colonies, 1st prize 500 fr., 2nd prize 300 fr.; (*e.*) For the best and most economical process (chemical or otherwise) to convert the Ramie ribbons into commercial filasse suitable for the use of textile manufacturors, 1st prize 1,000 fr., 2nd prize, 700 fr.

The entries previously made at the Ministry of Agriculture included 19 machines and 10 (chemical) processes. On the morning of the trials only four machines and one chemical process, were submitted to the jurors.

THE DELANDTSHEER MACHINE.

Taking the machines in the order in which they stood, the first was that invented by Delandtsheer of Paris (Décortiqueuse de Ramie Systême Delandtsheer). The cost was stated to be 40*l.* This was driven by steam power, and required two men to attend to it. It had a horizontal feed plate, and consisted of a series of rollers and crushers which received eight or ten stems at a time from the hands of the operator, and passed them on to be beaten by a pair of rapidly revolving drums very similar in character to those found in the Death machine. In the Delandtsheer machine, however, there is a reverse action attached of an effective character. When about five-sevenths of the lengths of the stems had been cleaned, they are quickly returned by means of the reverse action to the hands of the operator, who then presented the unclean ends to the machine and completed the operation. The fibre in this case was only moderately well-cleaned; there was considerable waste, and the actual amount of rather bruised ribbons was as follows: from dry stems, 5 kilos. per hour, and from green stems 18 kilos per hour. As the latter were weighed before they were dried, the calculations for dry ribbons would be about 6 kilos. If we take the result at 5½ kilos. per hour of dry ribbons, the Delandtsheer machine would produce only 55 kilos. per day of 10 hours, equal to about 120 pounds avoirdupois. The commercial value of these ribbons at 7*l.* per ton would be 7*s.* 6*d.*

The inventor claimed for the Delandtsheer machine that it could produce 3 cwt. of dry ribbons per day. The small out-turn at the trial was attributed by him to the poor character of the stems supplied. There was some cause for complaint on this head, but in any case it was difficult to believe that this machine could produce, as worked at Paris, ribbons in commercial quantity at a remunerative cost.

THE BARBIER MACHINE.

The second machine known as Barbier's (Décortiqueuse Armand pour la Ramie et toutes les plantes textiles : Constructeur Paul Barbier, Paris) was very similar in construction to the Delandtsheer machine already described. The cost was the same, viz., 40*l.* It was also fitted with a reverse action. The feed-plate was horizontal, and the operator handled about 8 to 10 stems at a time. The fibre was somewhat severely bruised in cleaning. In the first trial with dry stems it produced 3·6 kilos. per hour of ribbons. With green stems it produced only 7·5 kilos. in 47 minutes. There was a large amount of waste, and owing to the fibre being pushed backwards and forwards between the revolving beaters, the ends were often badly tangled.

It was claimed by the inventor that this machine could treat 2,500 kilos. of green stems per day of 10 hours, yielding 125 kilos. (presumably of dry) ribbons worth 50 francs per 100 kilos.

A machine illustrative of the Systême Lassalle (constructed by H. Chasles, Paris) was on the ground, but it was unable to compete in the trials. For the purpose of this report it may be passed without further notice.

MACHINE OF AMERICAN FIBRE COMPANY.

The next machine was exhibited by the American Fibre Company, of No. 18, Broadway, New York, under the charge of Mr. Noble. This was on an entirely different plan from any of the fibre machines hitherto in use, and deserves a few words of description. The machine was about 4 ft. 6 in. long and supported on standards about 5 ft. high. Above the machine was a wooden structure designed to receive the movable frames in which the stems were placed. The feeding was vertical from a frame containing about 30 stems placed above two wooden rollers working horizontally through the whole length of the machine. By means of a movable bottom in the feeding frame, the stems were dropped base-end downwards between the rollers which slightly crushed them. While firmly held in the machine the stems were pressed against a horizontally moving knife, which split them along their whole length. After this they were bent in such a manner that the woody portions were fractured and separated from the fibrous cuticle. The latter was ultimately delivered in two ribbons, one on each side of the machine. In this instance all that was attempted was to separate the fibrous bark from the stems and deliver the former in broad ribbons, almost intact. No attempt was made to remove the corky epidermis or separate in any way the constituent fibres. This machine was worked by steam-power and required three men to attend to it. The cost was not given. It was tried on green stems only, and produced at the first trial 7 kilos. of wet ribbons in 18 minutes. At the second trial it produced 12·8 kilos. of wet ribbons in 38 minutes. These results would be equivalent to 21 kilos. of wet ribbons per hour (or allowing one-third of the weight for dry ribbons) equal to about 15 pounds avoirdupois of dry ribbons per hour. It must, however, be borne in mind that the ribbons produced by this machine were simply the crude fibrous bark without any cleaning. The actual value of these ribbons would be very small; but if the machine had been capable of turning out half a ton, or even a quarter of a ton of such ribbons in a day, it would have possessed some value. The machine, as shown at Paris, it is needless to remark, was practically useless for commercial purposes.

THE ROYER CHEMICAL PROCESS.

The only chemical process for converting Ramie ribbons into filasse (or the beautifully white silky threads which Ramie is capable of yielding) for textile purposes was shown by M. Royer. This was described by the inventor as "Degommage de la Ramie Brute: Système, E. Royer, "Paris. Le traitement industriel complet de la Ramie Brute par ce "Système constitue une dépense de 10 a 12 fr. par 100 kilos de matiére "brute." The details of the process were not made known. The ribbons were laid horizontally in small portable wooden crates, and submitted to the action of certain chemicals in successive baths. Afterwards they were placed in an iron cylinder or closely fitting steam chest and thoroughly exposed to the solvent power of steam at high pressure. The filasse produced was beautifully white in some cases, but in others it was mixed with portions of bark and discoloured. The system appeared to be laborious and costly. The jury was unable to arrive at a satisfactory conclusion as regards the merits of the process during the session of the trials between the 25th and the 30th September, but the general opinion of those present was not favourable to the process.

The actual trials commenced on the 26th September and closed on the 30th. The first day was devoted to trials with dry Ramie stems, the second to green Ramie stems, while the third was chiefly devoted to the chemical process for converting ribbons into fibre. On the fourth day the jury carefully examined the construction of the machines, tested by a dynomometer the powers necessary to drive each one, and in some instances retried the machines in order to correct or confirm the results already obtained.

AWARDS OF THE JURY.

As regards the awards of the jury, in a letter received from the Foreign Office dated the 12th inst. enclosing a despatch from the English Embassy, at Paris, it is stated that "since the International "competition for machinery for, and methods of, decorticating Rhea "was held, the question of distributing prizes was duly taken into "consideration. But according to the information conveyed to the "Embassy by the French Ministry of Agriculture none of the advertised "prizes were given, the jury having only made the following awards, "viz.:—600 francs to Mr. Delandtsheer, 2, Place des Batignolles, "Paris; 400 francs each to the Compagnie Américane des fibres, "18, Broadway, New York, and to Mr. Armand, whose machine "was exhibited by Mr. Barbier, 46, Boulevard Richard Lenoir, Paris.

"No report on the subject of the competition will be published in the "*Bulletin de l'Agriculture* before the issue of the November number "of that periodical."

These are, briefly stated, the results of the Paris trials on Ramie. That the results are unsatisfactory and disappointing, and fall far short of the estimates of the inventors, there can be no matter of doubt. It is probable that a fresh series of trials will be inaugurated next year in connexion with the Paris Exhibition of 1889 ; and if the value of the prizes is increased there will doubtless appear a larger and better representation of machines and processes.

THE FAVIER SYSTEM.

It will be noticed that there was no trial this year of the Favier system which is in operation in Spain, and is described in the *Kew Bulletin* for June 1888, pp. 145–149. Nor was there a trial of the Death machine (constructed by Death and Ellwood of Leicester), which has been in use, experimently, in many parts of the world. The Favier process is being worked privately, and is therefore not available to the public. The fibre hitherto produced has been exclusively used in France ; but the quantity so far available has not been sufficient to base an opinion as to the permanency of the enterprise. M. Favier, who has long taken a deep interest in the Ramie fibre, was a member of the jury at the Paris trials, and the articles which he has contributed on the subject to the *Journal l'Industrie Progressive* of October 7 *et seq.*, may be looked upon as embodying the views of one of the best informed of French experts on the present position of the Ramie question.

THE TREATMENT OF DRY AS AGAINST GREEN RAMIE STEMS.

Amongst the French there is attached an importance beyond their value to machines for cleaning Ramie in the dry state. This has arisen partly, no doubt from the fact that the Favier system, the only one which hitherto has obtained a measure of success, requires the stems to be dried before they are treated. An idea was also prevalent in France that in some parts of the country it might be possible for the farmers to grow one or two crops of Ramie, and cut and harvest the stems in summer and work them off at their leisure during the winter. If a machine were devised to treat Ramie successfully, it is improbable that France could compete with tropical and sub-tropical countries, where three or four crops of stems could be reaped in the year. This conclusion is now being gradually adopted in France, and the future exploitation of Ramie is treated as a question which more nearly concerns Algiers and the French tropical Colonies.

As regards India and our own Colonies, it is essential that Ramie machines should work upon the green stems, and not upon the dry. In the rainy season, when the air is impregnated with moisture, to dry Ramie stems in the open year after cutting would be an impossibility. To attempt to dry by artificial means the enormous quantity of stems yielded even by a few acres would entail so much labour in handling, and so much expense for buildings and fuel that it would be altogether a hopeless task.

The per-centage of crude fibre yielded by Ramie stems is estimated at about 10 per cent. If the stems must be first dried before they are treated, it would be necessary to handle, to cart in and cart out again from drying sheds, 100 tons of stems for every 10 tons of fibre produced. It might be suggested that harvesting the stems should take place in the dry season, when the conditions would be most favourable to drying them in the open air.

This unfortunately would not be practicable. The stems grow best during the rainy season, and when once ripe they must be cut at once. Besides, it is evident that the sooner one crop is removed the better will be the prospects of the next. During the dry season the stems grow very slowly, and it has been noticed that such stems have short internodes, are very woody, and offer relatively greater resistance to the process of decortication.

OTHER PROCESSES AND MACHINES.

Of processes and machines not already mentioned, it is desirable to refer to one or two for the information of persons who may not otherwise become aware of them. In June of last year Mr. C. Maries, of Durbhungah, Bengal, forwarded a series of specimens of Ramie fibre in different states of preparation to Kew and asked for an opinion upon them. It appeared that he had invented a machine, worked by two men in the field, capable of operating upon two to three hundred stems per hour. This machine simply separated the fibrous bark from the wood. The bark was then operated upon by other processes and eventually it was deprived of gum and mucilage and worked into a tolerable fair fibre suitable for manipulation by textile manufacturers. This fibre was reported by Messrs. Ide and Christie as "long, fairly cleaned "Ramie fibre worth about 28*l*. per ton." The particulars of Mr. Maries's methods have not been made public; but we understand that a well-known firm of merchants in Calcutta has acquired the patent connected with them, and the system is now in course of being practically tested on a large scale.

In the columns of the *Times* there recently appeared an account of a machine invented by Mr. John Orr Wallace, and placed on view at the Irish Exhibition. This was termed a "patent scutching machine "for cleaning ramie, flax, hemp, &c." The apparatus is about 6 ft. high by 4 ft. wide, and 5 ft. long. It consists of an upper feed table 36 inches wide, on which the stems are fed to three pairs of fluted rollers, which deliver the stems downwards between five pairs of pinning tools, alternating with six pairs of guide rollers. The pinning tools somewhat resemble hand-hackles, and may be popularly described a/ as very co~~u~~rse wire brushes. They are attached to two vertical frames to which a horizontal to-and-fro motion is imparted, and the pins interlace as the two sides approach. The fibrous material is drawn downwards by rollers which have an intermittent motion, and at each momentary pause, the pricking pins enter the material and are rapidly withdrawn from it. By degrees this fibrous-descending curtain is delivered on to a sloping receiving table at the bottom of the machine, over which table the woody substance has previously passed to a receiver in a crushed and semi-pulverized condition, and perfectly free from fibre. This machine, it may be mentioned, was not constructed for the special treatment of Ramie. In spite of this, however, it has cleaned Ramie in a fairly satisfactory manner, and the inventor claims that, with a few necessary alterations in detail, he will be able to treat the stems either green or dry and produce clean fibre at the rate of 1 cwt. per hour. The machine can be driven by a two-horse power engine, and it requires two persons to feed and tend it.

Small quantities of Ramie stems grown at Kew have been successfully passed through the machine. It is proposed by the inventor, when he has completed the alterations, to submit this machine to a public test similar to that adopted at the Paris trials. For this purpose he states that a large supply of Ramie stems will be obtained from France.

There are some special advantages connected with this machine which deserve to be mentioned. In the first place the feed table is so large that at least 40 stems can be fed to the rollers at once. When the stems have been fully grasped by the rollers, the operator need not retain his hold upon them any longer. They pass on uninterruptedly through the machine, and they can be followed immediately by a fresh lot without the return action, which is an essential part of the treatment by the Death and the Delandtsheer machines. There is here a considerable saving in time, and there is also a complete absence of the rough usage to which the fibre is subjected in nearly all the purely mechanical processes which have hitherto come under my notice.

Personally, I am unable to express an opinion upon the Wallace machine. To say that it is more promising than any machine exhibited at the Paris trials is merely to affirm that it is not altogether a failure. When the machine is fairly tested on its merits, and it is worked continuously on large quantities of Ramie stems, the results will speak for themselves. Until that is done it is obviously undesirable to do more than draw attention to a machine which possesses considerable merit and which, with further improvements, may be rendered of service in the production of fair marketable fibre.

General Conclusions.

An eminent firm of brokers recently informed me: "There is no "doubt that Ramie is exciting great interest in many parts of the world, "and many people are experimenting with various processes for extracting "the fibre cheaply and quickly. We cannot say that any results sub- "mitted to us up to the present time are quite satisfactory. The fibre "is either imperfectly freed from gummy matter, or the process breaks "down in the matter of cost or owing to the local conditions under "which it must be carried on. We consider that no system of "preparation which cannot produce the clean, unbleached fibre under "30*l.* per ton is likely to succeed in establishing this article firmly "in the estimation of English textile manufacturers."

This opinion expresses very briefly and clearly the conclusion at which I have arrived in connexion with the preparation of Ramie fibre. It is quite possible that some machine or process will eventually solve the problem, but at present the exploitation of Ramie, in spite of years of labour and the expenditure of large sums of money upon it, cannot be said to have yet emerged from the experimental stage.

D. Morris.

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 24.] DECEMBER. [1888.

LXX.—INHAMBANE COPAL.

(*Copaifera Gorskiana*, Benth.)

The term copal is commercially applied to various hard gum-resins yielded by certain tropical and sub-tropical trees. In the majority of cases copal is obtained in a semi-fossil state on land where no trees at present are found, but where, at one time, large forests existed. In other cases what may be termed recent copal is a gum-resin in a comparatively fresh state collected from living trees or from trees in a state of decay.

There are numerous commercial distinctions between varieties of copal. It is unnecessary here to do more than draw attention to some of the chief plants yielding these substances. Zanzibar copal, or Anime, one of the most valuable of any now used in commerce, is obtained from *Trachylobium Hornemannianum*, Heyne. Sierra Leone copal is derived from *Copaifera Guibourtiana*, Benth. What are known as Lisbon copal, recent and fosssil; pebbly copal from Accra, on the Gold Coast,

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1888.

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and Benguila copal, are all probably furnished by species of *Copaifera*, but material for their determination has not yet been received. Sierra Leone and other fossil African copals are the foundation of all fine varnishes. The locust tree of tropical South America (*Hymenæa Courbaril*, L.) yields a resinous substance resembling gum anime, which is found in masses in cavities, and at the bases of old trees. The well-known Dammar, or Kauri, gum of New Zealand is yielded by *Dammara australis*, Lamb. This is extensively excavated from the sites of old forests, and the exports from New Zealand in 1883 were 6,518 tons, of the value of 336,606*l*. Indian copal, or white dammar, used in varnish on the Malabar coast, is obtained from *Vateria indica*, L. Black dammar is the produce of *Canarium strictum*, Roxb.

Recently a new source of copal has been discovered in South-east Africa, which has created a good deal of interest.

The first particulars respecting this new copal communicated to this establishment are summarised in a communication made by Mr. Thiselton Dyer to the Linnean Society (*Journ. Linn. Soc.*, vol. xx. pp. 406–8) :—

In the course of last year we received from the Foreign Office a copy of a despatch (dated June 11th, 1882) to the Secretary of State from Mr. Henry G. O'Neill, Her Majesty's Consul for Mozambique. I extract the following passages from it [*] :—

"I have the honour to report, that from Mr. James Heathcote, of Inhambane (the trader that was employed by me for the recovery of the body of the late Captain Wybrants), I have received information of the discovery of a considerable tract of copal forest, which, if it should turn out to be as rich as he anticipates, will add a valuable export to the trade of that place. He had just returned from an expedition to the interior, and writes : 'The forest where I obtained this gum, of which I
' send you specimens (I have collected six tons), is fully 200 miles long.
' It is a belt which runs parallel with the coast and the first range of
' mountains ; from Inhambane it is nearly 100 miles to get right into it.
' The distance of the forest from Inhambane may retard its being opened
' up ; but its discovery adds to the known wealth of the district, and a
' new export to the place.' Mr. Heathcote further adds : 'The native
' name of the gum is *Stakate* and *Staka* ; the Zulu name for the gum is
' *Inthlaka*. . . . . The tree domineers over all. The gum has a
' beautiful odour if pounded and burnt, also if boiled in a pot of water.'
The ordinary gum copal tree of the mainland of Zanzibar and Mozambique though, as a rule, lofty, is by no means of the striking stature indicated by Mr. Heathcote."

The first thing that struck us from a superficial examination of the specimens sent by Mr. O'Neill was that they were entirely different in appearance to ordinary East African copal (the produce of *Trachylobium Hornemannianum*) exported from Zanzibar. They consisted in part of waterworn pebbles, and very much resemble the Accra copal[†] which is exported from the West Coast of Africa. They are destitute of the characteristic goose-skin texture frequently observed in Zanzibar copal, and, as Sir John Kirk informs me, possess an entirely different odour.

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[*] Some extracts from Consul O'Neill's despatch appeared in *Nature* for Aug. 10, 1882, p. 351, but I reproduce the substance here in order to make the whole account complete.

[†] An interesting paper by Dr. Welwitsch on West African Copals, in *Journ. Linn. Soc.*, Bot. IX., pp. 287–302, may be consulted ; it does not, however, carry our knowledge very far.

That the product was not identical with Zanzibar copal was further established by a report with which Messrs. Robert Ingham Clark and Company, the well-known varnish-makers of West Ham Abbey, very kindly furnished us upon some of the specimens which we sent to them for examination. After pointing out the resemblance to Accra copal, they continue:—"They [the specimens] contain (some more than "others) a considerable quantity of essential oil and have an average "melting-point of 337° Fahr. This is not high, and we consider that "they are a semi-fossil exudation. It is very difficult to give an exact "commercial value to them; but as they *now* are, and mixing them "together to represent one bulk, we should say their value would be "about 80*l.* to 100*l.* a ton . . . . Certain descriptions of animi "shipped in a very clean and picked state from Zanzibar sell in this "market as high as 400*l.* a ton."

With a further despatch dated February 14th, 1883, Consul O'Neill sent samples of the leaves and bark of the tree yielding Inhambane copal. Supposing that Consul O'Neill's collectors have made no mistake in the identification, Professor Oliver, the Keeper of the Kew Herbarium, was satisfied that the leaves afforded sufficient data to fix the species as *Copaifera Gorskiana*, Benth. Although it is stated in the *Flora of Tropical Africa* (vol. ii. p. 315), on the authority of Sir John Kirk, that this tree affords a good hard timber, it was not known before that it yielded a copal suitable for commercial purposes.

The identification is the more interesting on account of the resemblance of Inhambane to Accra copal. The latter has long been suspected to be produced by a species of *Copaifera*. Sierra Leone copal is ascertained to be derived from *Copaifera Guibourtiana*, Benth. Students of tropical African botany are familiar with the occurrence ef the same genera, and even species on both the east and west coasts. *Landolphia florida*, one of the African rubber-vines, is a striking example of this wide distribution.

Subsequent to the date of the above communication, further specimens of leaves and fruit were received from Mr. Heathcote on the 5th February 1886. The latter fortunately contained good seeds, and from these several hundred plants were raised. Mr. Heathcote states:—"Many tons of copal have now been exported from Inhambane. For "some choice pieces I have received as high as 13*l.* 10*s.* per cwt. The "average price realised on larger lots has been 7*l.* per cwt. The "forest containing the trees extends from the River Sabia in a south-"westerly direction as far as Beleni . . . . . the soil is some-"what sandy, with a sub-soil containing limestone . . . . the "seeds are ripe on the trees in May."

For a description of the species see Oliver's *Flora of Tropical Africa*, vol. ii. p. 315. There is a figure under the name of *Gorskia conjugata*, Boll, in Peters' *Mossambique*, t. 13.

Inhambane copal has been successfully introduced during the past year from Kew to India, Fiji, Singapore, Jamaica, Trinidad, Demerara, tropical parts of Australia, and Dominica. Plants for Ceylon and other colonies are ready to be distributed next summer. It is important to bear in mind that this plant yields a valuable timber as well as copal.

LXXI.—THE CULTIVATION OF RICE IN BENGAL.

The following interesting summary of information respecting rice culture in Bengal has been communicated by Mr. C. B. Clarke, F.R.S., well known as an accomplished Indian botanist. Mr. C. B. Clarke was a member of the Bengal Education Department and is the author of several papers published at Calcutta, but inaccessible in England, dealing with rice culture. Possessing considerable practical knowledge of rural economy, his views on this subject, based on personal observation, are stated with perfect frankness; even those who may be indisposed to agree with him altogether must feel that on a subject of this nature it is very desirable to throw as much light as possible:—

DEAR MR. THISELTON DYER, Kew, 10th October 1888.

IN reply to your request to furnish you with the substance of what I have published in Bengal regarding the growth of rice, I willingly write as much as I can recollect; but I have none of the original papers at hand, nor any notes, and what I now write must be deficient altogether in quantities, and imperfect in many other ways. My account refers to the Lieutenant-Governorship of Bengal only.

In Bengal several hundred varieties of rice are distinguished, named, and cultivated. I have written of them under three main heads, viz.:—

(1.) Rowa; harvested in November–January; grown mainly in small fields surrounded by a bank 4–12 inches high, and often at no period of growth more than 6–12 inches deep in water.

(2.) Amon; harvested in November–January; swamp-rice, often 2–8 feet (locally even 14 feet) deep in water for several weeks in August and September.

(3.) Owsh; harvested June–August.

It is perhaps hardly necessary to state that there are numerous sorts of rice intermediate to the above three. The Rowa is the most valuable crop; and I proceed to describe the cultivation of what I have taken as the type variety.

THE ROWA CROP.

Rowa can only be grown where there is some clay in the soil to prevent the water slipping away; the finest Rowa is grown where the small bank round each little field retains the late rains (which are usually much broken), so that throughout October the Rowa is always in mud, but rarely 6 inches deep in the water. On such Rowa land there is very rarely any second crop; the land remains untouched from December or January (when one crop comes off) till July–September (when the next is dibbled). It grows a Rowa crop every year—without any manure—and has done so from time immemorial; and in order to find any case of serious failure in the Rowa crop of Central and East Bengal I believe it is necessary to go back beyond human memory when an altogether abnormal failure in the rainy season occurred. The Bengalees, with that inverted view of political economy favourite to them, have several times given me, as the reason why a second crop in the year is not taken from the Rowa land, that the Rowa is so valuable that it is ample to pay the rent and leave the cultivator a living. The rains in Bengal become heavy between 15th and 30th June; towards the end of July (it might be done earlier), and more often between 1st August and 10th September, the cultivator commences what we call (by a misemploy of the English language) ploughing. His implement is a vertical post with a flat shoe at the base, all of wood; it is, in brief, a simple cultivator. Many of the fields do not contain 10 perches, and very many not a rood, in area; and within the small plot bounded by his little bank the cultivator goes round and round and across and back again in a very promiscuous way. After the "plough" comes the "mowee," a small heavy wooden frame; but the "plough" often goes over the ground behind the mowee again. By the combined operation of these implements the field to a depth of 4 to 6 inches is reduced to a stiff mud, the water remaining mostly in the upper portion; the weeds, especially the creeping grasses, having been thoroughly picked out and laid mostly on the little bank (this is the important feature in the process; they are largely collected by the mowee, which works as a very coarse bush-harrow). The rice is then dibbled (it is taken about a foot high from a seed-bed) with a stick; it gets a firm hold on the "pan," the surface of the undisturbed soil. The seed-bed is usually in the village or near the cultivator's hut, *i.e.*, in unflooded land, where rice for dibbling is raised in a dense mass on a very small plot; and if not dibbled out exactly at the right age soon gets very yellow. The Rowa rice requires nothing more done to it till the day it is harvested; where the land is terraced, and to a less extent in the apparently dead flat of Bengal, the water requires a little watching and regulation. But no weeding is required; the Rowa has a fine start of the weeds; there should be no creeping grasses left; a great multitude of annual weeds of many species grow in the Rowa fields, but they are mostly low, and they exert no appreciable effect on the crop.

The Rowa crop depends very little on the early setting in of the rains (the Government printed reports I am aware imply a contradiction of this statement), but almost entirely on the rain holding on in the autumn. The Bengalee expects rain at least once a week during October, and enough to prevent his rice drying up before quite the end of the month; if he gets this he has a full crop (and I say whether he dibbled early or as late as 15th August to 10th September). If the rain holds on steadily (*i.e.*, sufficient in quantity and at sufficiently short intervals to prevent the Rowa field getting dry) to the beginning of November (as I have known it do nearly half the seasons I have witnessed) the crop is a bumper. If the rain stops by 10th–15th October, so that the Rowa fields then dry up there may be a three-quarter crop. If the rain stops before the end of September, as it did in Orissa in 1869, the crop (at least all the August–September dibbled) fails. Also, if the rain stops by middle of October, so that the rice dries up, a late downpour in November or December (which I have seen twice) does harm rather than good.

The Rowa rice is the food of the upper classes in Bengal. It is to be noted that the cultivator except at harvest (when the weather is set fine and he works easily) does not do a day's work on his Rowa land in the year, except about a couple of days at dibbling time. Those who propose to teach the Bengalee cultivator a more elaborate system of rice farming must ponder this fact well.

THE AMON CROP.

Amon, the deep-water rice, grows with the water; the flag of the rice just resting on the surface of the water. The height of the Amon depends on the height to which the water rises. Occasionally, and very locally, the water may rise very suddenly two feet so as to cover the rice completely which then perishes, but in general the water rises (in Central and East Bengal) very steadily till the latter end of August (or till the middle of September sometimes) and then sinks away as steadily—often more rapidly. The way in which the Amon is got in varies very greatly with the circumstances of the land.

In Central and Eastern Bengal (as in all alluvial deltas) the banks of the anastomosing rivers are usually the most elevated grounds, and on these very commonly the villages stand. As you walk in the cold season from one river to the next you insensibly descend from the river-bank till you come to the "bheel" which at this season may be shallow, or mud, or wholly dried up; and you insensibly ascend similarly from the bheel till you come to the bank of the next river. Now this bheel will begin to swell in spring—sometimes as early as April (when the April showers are strong), sometimes not till June if these showers are light, and May dry. As each band of land round the jheel gets softened it has to be tilled and planted with rice before it is submerged more than a very few inches. The bheel will swell till it covers the whole country except the narrow belt by the rivers occupied by the villages; and the getting in the Amon may thus extend for three months. If the water rises very nicely and steadily the Amon may be dibbled, provided there is a seed-bed of rice just ready at the moment required, or the cultivator may be driven to sow it broadcast; or if the water rises by sudden jumps the cultivators may fail to plant considerable areas altogether. The Amon, if dibbled, is dibbled much earlier than the Rowa. Amon is not only a coarser, less valuable rice than Rowa, but owing to its being often sown broadcast, owing to its being longer on the ground, and owing to its frequently being put in hastily, it is much more damaged by weeds of various kinds than Rowa, and in particular it is liable to the pest of Oori which causes severe toil to the cultivator. "Oori" is believed to be the wild state of *Oryza sativa*, the origin of our cultivated rices, and being so nearly allied it is therefore the most pestiferous weed of rice. When Amon is about 2 to 4 feet deep in water the cultivators will be seen proceeding in their boats to their fields; they then get down into the water and remain hours (usually having large round hats of plaited strips of bamboo on their heads) drawing the Oori and piling it on their boats, which return to the village as small floating haystacks; the Oori is eaten by the cows which at this season are kept chiefly in long sheds in the village, just above the water level. I do not know how, in this young state, the cultivators tell the Oori from the Amon. I cannot. The Oori grain is good in quality, but so very caducous that it is impossible to harvest it on any considerable scale. The children often do, with the aid of a large cloth, harvest the Oori that fruits in ditches and waste corners and so collect a considerable quantity of good grain. The typical Amon swamp-rice has often a pink tinge on the husked grain; it is the main food of the masses in East and Central Bengal, but considered of very inferior quality to Rowa and is always much cheaper. [In Behar the masses do not get rice as the principal part of their food.]

THE OWSH OR SPRING RICE CROP.

Owsh, or spring rice, is much smaller in quantity than the preceding two classes, though there are highly-valued varieties raised in Zillah Burisal. But, as a whole, the Owsh may be treated as generally of very small importance. In the famine of 1874 a fine Owsh crop in Central Bengal (Zillah Jessore, &c.) early reduced the pressure for food. On Owsh land there is nearly always grown annually a second crop that is not rice.

On concluding the above description, and before going on to criticise fashionable schemes for teaching the natives how to grow rice better; I should warn you that many points in the above description have been controverted; and in particular it has been asserted, not only by Calcutta English newspapers, but by Government officers, that there exists no such rice as I have described as Rowa.

RENOVATION OF SOIL IN RICE FIELDS.

In the Rowa fields, as I describe them, the rice gets only rain-water, and the water drains from the fields into the rivers. Liebig says that the reason why rice can be grown in Bengal every year in the same fields without manure is because the rivers annually replenish the soil by a layer of rich silt. My critics see that the rice round Calcutta town and along the two principal railways in Bengal is all Amon; and they think that rice could not grow for ever without the aid of the silt. I called their attention to Roxburgh's *Flora Indica*, v. 2, p. 202, where he maintains that much of the rice land in Asia receives no help except what the air and rains yield (*i.e.*, as fully explained, neither inundation nor any material quantity of manure); yet that these fields have for probably thousands of years continued to yield annually a large crop of rice, thirty to sixty fold. Roxburgh barely ventures to suggest that a recuperation of the soil takes place between January and June.

On the west side of the great Bengal Plain, from Rajmahl and Burdwan to Orissa, the hills rise in many places gradually, and we see a great quantity of terraced rice; it is clear that these fields cannot be inundated from the rivers. As we proceed further into the western hills we find V-shaped valleys terraced in narrow curved platforms; the rain-water is led down gradually from one to another; there is on the outer edge of each platform a little bank, usually not more than 6 to 12 inches high, and the rice is therefore never more than a few inches deep in water; this terraced rice is a subvariety of Rowa in my classification, and it gets nothing but air and rain-water; it is the kind of rice land Roxburgh refers to, his account being drawn up in the Circars immediately south of Orissa. Not rarely in this kind of rice cultivation a bank is drawn across the upper part of the valley and a tank formed immediately above the rice platforms; from this reserve the rice can be watered after the rain stops and the crop almost ensured. Now in all these cases it is manifest that the rice fields can get no manuring by silt from the rivers.

In the north and east of Bengal the hills rise very suddenly from the plains; there is little terraced rice, but there is a broad belt of land in which there is enough clay in the soil for Rowa, that extends from Mymensingh to Chittagong. In the most valuable rice land, as on the right bank of the Bruhmapootra, throughout the Zilla of Mymensingh, the water runs from the rice fields to the Bruhmapootra, and the fields are never deep in water. The land in the thoroughly inundated districts, as south-west Dacca and Furidpore, is too sandy to grow Rowa rice, and it is much less valuable than the belt of Rowa land near the base of the hills. Roxburgh says in the place above cited (v. 2, p. 2.2) that "the "best rice lands are those that are overflowed annually by the inunda-"dations of large rivers." But he is speaking of the Circars; he probably never saw the fine Rowa land of Mymensingh, Comilla, and Noakhili. The gross produce of swamp rice may be about as large as that of Rowa, though raised at a greater cost of labour; but the value of the crop per acre is very much less.

I am prepared to go further and to doubt whether even swamp rice gets much silt. Where the water from a muddy rapid river gets through its bank (which is the highest part of the country) and spreads out over the lower country beyond, it loses its velocity very fast, and therefore drops all its silt in the "bank," *i.e.*, near the river it has left. If this were not so the bheels would soon all fill up, and the "banks" (they may be a quarter of a mile wide) would not be the highest parts of the country. In fact, in swamp rice, the water is perfectly still and black, evidently all or very nearly all rain-water. Where the land is well silted, as in the case of large sandbanks, it is impossible to grow any rice but a little Owsh, and usually not that till the land has been made more tenacious by a few crops of indigo or some other leguminous crop. I have no doubt of the most important fact that a large class of rice fields in Bengal, annually cropped without manure or silting, maintain a perennial fertility; though, like Roxburgh, I may not be prepared with explanation. John Scott, who was in 1870 curator of the Calcutta Botanic Garden, was of opinion that in these rice fields the recuperative power of the soil is sufficient, under the sun and rain of Bengal, to go on growing the present crops of rice indefinitely.

Improvement in Rice Culture.

Next I come to proposals that have been made to teach the Bengalees how to grow rice better. A favourite proposal is to give them an English plough, which shall go deeper than the native cultivator and bring up fresh soil. I pass by the practical difficulty that in none of the terraced fields and in none of the small fields, without a revolution in boundaries and customs, could such a plough be used. The plough is the most perfect implement yet devised for setting in creeping grasses, as couch; it cuts the creeping rhisome into convenient lengths, and by the turnover buries the fragments deep. If in England a farmer is about to put in a large field of barley or beans and sees a patch of couch grass in the fallow he misses that patch with the plough, and at some dry time in early summer he turns in a party of boys to tease the grass thoroughly out. Some bad (or about-to-quit) farmers will plough a field full of creeping grass to get a corn crop; they get an inferior corn crop and the field is then found (in vulgar parlance) to be "clean run out," or (as I should rather put it) to be so thoroughly foul that it will take two years at least and a heavy outlay to get it straight. Now in India we have, not one or two, but many creeping grasses to contend with; the safety of the Bengalee cultivator is that he has a hard pan, impervious to creeping grasses, which his cultivator travels upon but never has broken. He gets the creeping grasses well out of the top 4–6 inches of his soil, and has a full crop on his shallow tilth if the water is right. I may add that if a Bengal field was ploughed with an English plough just before dibbing, I doubt whether the rice would get a firm enough hold.

I have never inspected a Government experimental farm. Dr. Watt tells me that on one of these he has known the skilled European agriculturalist plough deep with an English plough in April, as soon as the first rains had softened the ground a little. The field was then left till July or August when it was tilled in the native fashion and dibbled with rice. By this plan a much better crop of rice was obtained in a season when the rain ran short than in the adjoining native fields.

I have no doubt this would be the result. The English skilled agriculturist in this case would have been careful to have the land perfectly clean before he commenced on it with his English plough.

I am not at all sanguine of success in applying the English plough in Bengalee hands to rice growing in Bengal. I fancy it would be exceedingly difficult to induce a Bengali cultivator to clean his land thoroughly before ploughing, or to undertake any extra labour to ensure a better crop in a bad season; he would say that if the rain should not last on the average time that would be the will of Providence. Moreover (as see below) I think there is something easier than deep ploughing which might be done to assist the crop when the rain stops too early.

MANURING RICE FIELDS.

A second favourite proposal is that the Bengalee cultivator should be taught to manure his rice. It has been urged on the Lieutenant-Governor of Bengal (in a formal agricultural council), that the lowest classes in Bengal should be taught chemistry, but I will pass that by. The Bengalee cultivator has little manure and he applies what he has mainly to his cold weather crops. There is a considerable quantity of cowdung used for fuel. It might be possible to forbid by police ukase the burning of cowdung in Calcutta and its suburban municipalities; I do not think it would be remunerative to purchase extraneous manures. The effect of manure may be considered as similar to that of deep ploughing, and it must be recollected that it is quite possible to get corn too strong. The rice crops, when a full one, often suffers before harvest by getting laid into the mud and water when the country is drying up in November; this is especially the case with the Amon.

EXPERIMENTS WITH CAROLINA RICE.

A third Government plan has been to introduce experimentally foreign prolific sorts of rice. The Carolina rice has a large grain; it does not follow that the produce per acre would be larger, far less that it would be more valuable than that of Bengalee small-grained kinds. Government for 20 years past has been sending round this Carolina rice for trial in Bengal. A bag of seed rice is sent to each collector; the collector hands it over to some Bengalee gentleman supposed to take an interest in agriculture; the reports finally got in by the Bengal Secretariat are found on the whole unfavourable. In 1870 the Bengal Government called on the Calcutta Botanic Garden to try Carolina rice. The Curator, Mr. John Scott, grew it on ordinary rice land outside by Bengalee cultivators in their own way, merely supervising them to see that the rice was forward in the seed-bed, the land thoroughly cleaned, and the dibbling early. There was a very heavy crop, but no native dealer would purchase it, and it was finally bought by a European merchant for export to London. Government is still (up to three years ago) sending round bags of experimental Carolina rice to the collectors. The Bengalees distinguish shades of flavour in rice; they do not like American or Burmese rice; they do not like large-grained coarse rice; and they do not like newly harvested rice, as they say it disagrees with them extremely. The Rowa rice in Mymensingh, harvested in December, is kept in raised well-thatched granaries till the following August, when the Calcutta traders' large boats arrive; it reaches Calcutta just aged enough for the Calcutta baboos to eat. In the 1874 famine Government imported Burmese rice largely into Behar and distributed rations of it to those employed on the famine relief works. But these recipients largely sold their rations to traders, by whom the Burmese rice was exported back to Burma.

SUGGESTIONS FOR IMPROVING RICE CULTURE.

I concluded my first (1868) paper on rice by saying that I did not think we had much to teach the Bengalees in rice growing; and this statement did not, I fear, conduce to the popularity of that paper. I will venture here to mention a few points where I see the best chance of improvements being effected.

One most important point is that the Rowa should be dibbled out as early as possible. This is in general not done; the rain comes, and by the middle of July the cultivator tills his field but the plants for dibbling are not ready; a month or six weeks later often he cultivates his field over again and dibbles it. One reason of this is the deep-seated Bengalee principle never to do to-day what can possibly be put off till to-morrow, and to do everything incompletely; he says, "it is not quite as it should "be, Sahib, but it will act (chullibai)." The real difficulty in introducing any improvement in Bengal is to infuse some energy into the native character. In the majority of the seasons I have seen in Bengal I know no reason why the rice that was dibbled between 1st August and 7th September might not have been dibbled between 1st July and 7th August. The advantage of promptness would outweigh, I believe, all the deep ploughing and manuring that will ever be introduced in Bengal. If the rain holds on through October it nowise injures the forward rice; while if the rain stops between 1st and 15th October the forward rice gives nevertheless an excellent crop. Many of the simple savages on the frontiers of Bengal exhibit much more punctuality in business than the civilized Bengalees. I cannot help suspecting that the magnificent rice crops I have seen (in the Naga hills in the extreme north-east no less than in the Kolhan in the extreme south-west) are due to their promptness in dibbling; but I have never spent a whole season among these peoples.

A difficulty is encountered, it is true, in dibbling rice in Bengal from the uncertainty of foreseeing the exact time when the land will be ready for dibbling, so that it is impossible to raise the seed-bed to fit; the rice must be a certain length for dibbling and cannot stand over long in the seed bed, so that the native cultivator plants his seed bed in fair average time; rather late than otherwise. It thus often happens that the field is wet enough for tilth before the seed bed is ready for dibbling; and in one season I saw in Burdwan the water came so late that the seed-bed rice was seriously injured (and some dead) before it could be dibbled and a deficiency in the Burdwan crop ensued. But this difficulty could surely be met by some combination among the cultivators to have a series of seed-beds "to follow in succession."

RAILWAYS AND TANKS.

For the increase of the gross rice produce in Bengal (the real object of Government), the most important point is improved communication. There are still very large areas in Chota Nagpore, Assam, and the margin of the Soondreebun, which would be made to grow rice, if communications gave a good market. Also irrigation tanks could be largely increased in Chota Nagpore, where the long gradual slopes at the head of the valleys lend themselves to such. Communications in Bengal mean the enlightenment of the population; not merely by the penetration of European enterprise, for no well-educated Bengalee wishes to live in the wilderness, and the opening of a railway produces a line of good schools, where before, at great direct cost to Government in paying discontented teachers, no satisfactory schools could be kept.

Whatever is to be taught the Bengalee cultivator must be taught by example. It is no use whatever to lecture him; it is absurd to expect him to adopt a new, outlandish, and troublesome process unless you show him clearly that it is remunerative. You must therefore have model farms in central, accessible situations where this can be shown.

OTHER CROPS.

I fear that it will be very difficult for Government to show remunerative improvements in the cultivation of rice; there are many native crops where I believe such may be shown. Europeans, I notice, even of very low skill, usually grow sugar cane to a profit; it is a crop that responds to deep and clean cultivation, and to manure. I have often thought that if one tenth of the English energy and capital had been devoted to the wild date palm (*Phœnix sylvestris*) that have been devoted to tea, the results would have been very surprising. Few educated natives take any real interest in agriculture; on the European tea plantations Bengalee baboos are kept as clerks in the office; but as overseers, both in the field and in the factory, Paharias are usually preferred to Bengalees. The Bengalee cultivator esteems rice as the great crop; and, if he tries to grow any other, be it sugar cane or onions, his one idea is irrigation. My view is that rice is the very last crop on which we should attempt to give the Bengalee instruction.

C. B. CLARKE.

LXXII.—SILKWORM THORN.

(*Cudrania triloba*, Hance.)

With Plate.

This is a tree evidently of wide distribution in China, and known as the Silkworm Thorn. Its Chinese name is *Tsa*. It belongs to the tribe *Artocarpeæ* of the natural order Urticaceæ. As an ornamental shrubby tree it was introduced to this country in 1872, and a plant (bearing staminate flowers only) growing at Kew has proved sufficiently hardy to stand the winter in the open ground. The juvenile shoots are armed with strong, straight-pointed, axillary spines, while the leaves on the same shoots are broadly three-lobed. The central lobe is ovate-deltoid and much longer than the side lobes. The leaves of mature, fruiting branches are entire, broadly elliptical or obovate-elliptical, smooth above, pale beneath, $2\frac{1}{2}$—$4\frac{1}{2}$ inches long and $1\frac{1}{4}$—$2\frac{3}{4}$ inches broad; the petioles are $\frac{1}{3}$—1 inch long. The staminate and pistillate (diœcious) flowers are in globose heads (capitula) single or in pairs in the axils of the leaves. The fruiting capitulum is elliptical, compressed, somewhat hard, and shining.

The plant was described under its present name by the late Dr. Hance, in *Journal of Botany*, vol. VI. (1868), p. 49. See also a detailed account in *Journal of Botany*, vol. XXI. (1883), pp. 145–149. The synonymy is *Cudrania tricuspidata*, Bur. in Lav. Arb. Segrez. 243, and *Maclura tricuspidata*, Carr. in Rev. Horl. 1864, 390, fig. 37, and 1872, 56, fig. 7. It is also figured and described in Nicholson, *Dict. Gard.* ii. 312–3.

Its extensive distribution in China may be gathered from the fact that there are specimens in the Kew Herbarium from Shantung, Shanghai, Ningpo, Ichang, Kiangsi, Kwanlung, and Hooper Island, Corean Archipelago. For a very complete set of specimens we are indebted to Dr. Henry, of Ichang, who is an indefatigable and careful observer of Chinese plants. Dr. Henry states that the Silkworm Thorn is considered to be as good for silkworms as the mulberry, but it is not used so long as mulberry leaves can be had, because the tree is thorny and it is troublesome to pick off the leaves. It is given chiefly to adult silkworms, and as mulberry leaves soon become finished it is much used. The tree attains a height of about 20 feet.

The *Bulletin* is indebted to the Bentham Trustees for the opportunity to add a plate of this interesting plant from the *Icones Plantarum*, vol. VIII., pl. 1792.

Explanation of Plate.—Fig. 1. Staminate flower. 2. Stamen and subtending perianth segment. 3. Pistillate flower, immersed in its capitulum. 4. Single female flower removed. 5. Same in section. 6. Portion of fruiting capitulum. 7. Fruit and style base. 8. Fruit laid open. 9. Embryo. *Enlarged.*

LXXIII.—JAMAICA INDIA RUBBER.

(*Forsteronia floribunda*, G. Don.)

Latterly attention has been drawn in the *Kew Bulletin* to more than one direction in which it may be hoped to enlarge our supplies of india-rubber, and correspondents of this establishment, at home and abroad, have suggested improved methods of tapping the trees and coagulating the milk, so as to produce the best qualities of commercial rubber.

The principal papers on these subjects are, Nicaragua, or Central American rubber (*Castilloa elastica*), *Kew Bulletin*, Dec. 1887, p. 13; Macwarrieballi or Demerara rubber (*Forsteronia gracilis*), March 1888, p. 69; and Lagos rubber (*Ficus Vogelii*), November 1888, p. 253.

To these may now be added a further note on a new rubber plant, native of Jamaica, which has already been referred to in the Kew Bulletin for March of the present year (pp. 70, 71.) as *Forsteronia floribunda* (Grisebach's *Flora, British West Indian Islands*, p. 412). This plant is known locally as the milk wythe, or milk vine. It appears to be entirely confined to the Island of Jamaica, and is found as a climbing shrub in the mountain woods of the interior in the parishes of Manchester and Saint Elizabeth. It is closely allied to the Demerara rubber plant already mentioned, but the caoutchouc, judging by the results of experiments made by the India-rubber and Gutta-percha Company of Silvertown, appears to lend itself more readily to the requirement of manufacture.

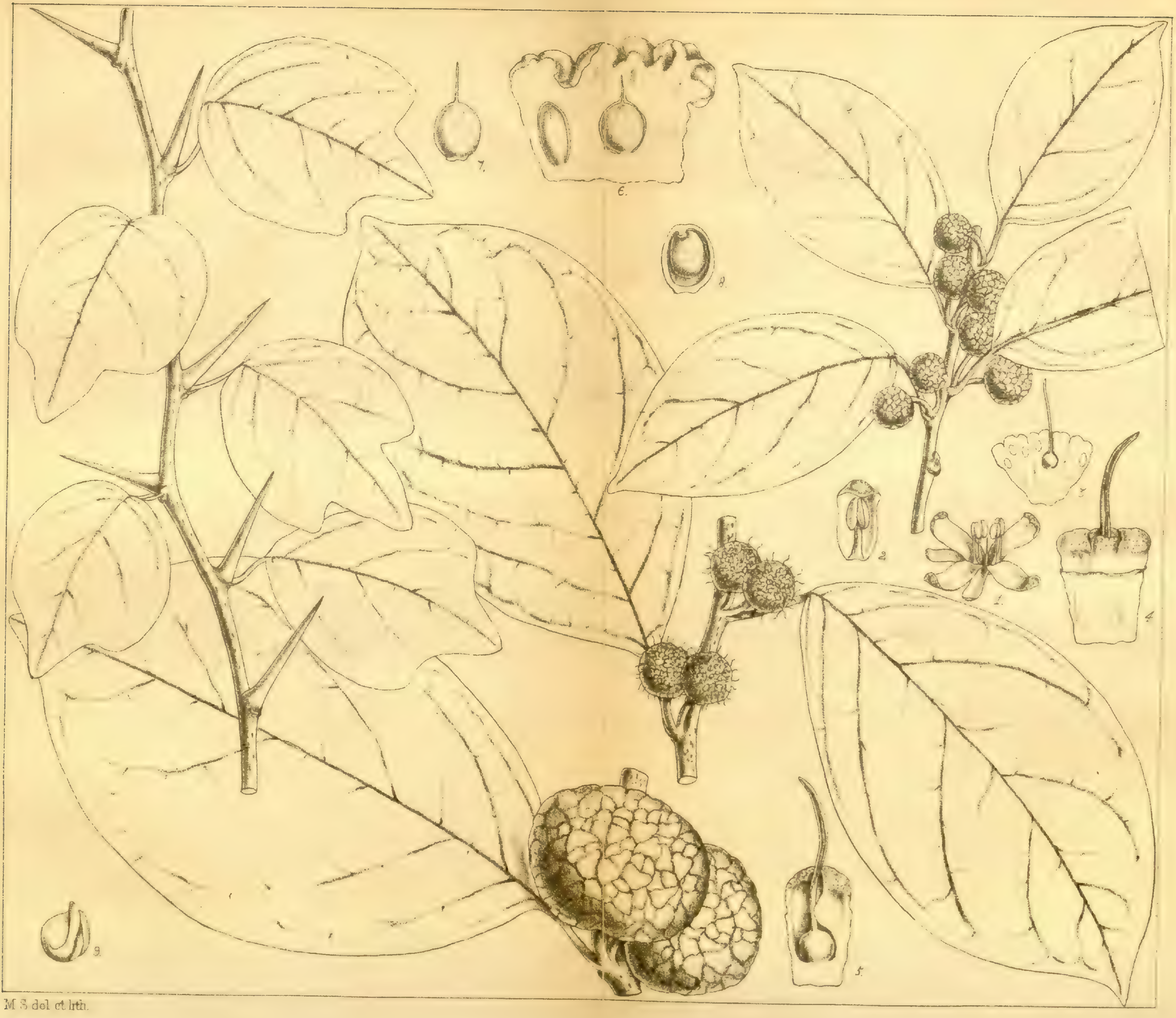
Attention was first drawn to the Jamaica rubber plant in the Report of the Director of the Botanical Department, 1883, p. 17, and again in the Report for the year 1884, pp. 46–47, from which the above particulars have been taken:—

ROYAL GARDENS, KEW, to COLONIAL OFFICE.

SIR,
Royal Gardens Kew, 26th October 1888.

I HAVE the honour to forward herewith the accompanying papers relating to an important india-rubber plant (*Forsteronia floribunda*, G. Don) native of Jamaica which has been in course of investigation by this establishment.

2. The inquiry in regard to this plant was first taken up some time ago, but recently at the request of Kew, the Reverend E. Bassett Key, who throughout has taken a warm interest in the subject, forwarded here a bottle of latex for the purpose of determining the commercial value of the rubber.



M S del et lith.

Cudrania triloba, Hance.

3. The report of the India-rubber, Gutta-percha, and Telegraph Company of Silvertown, obtained through S. W. Silver, Esq., F.L.S., proves that this native rubber of Jamaica is of high industrial value, and it might give rise to an important local industry if it were found possible to increase the plant by cultivation and to pursue the subject in a systematic manner.

4. On this latter point the Government of Jamaica will, no doubt, consult Mr. Fawcett, Director of the Botanical Department.

5. The supply of india-rubber as a forest product is destined to fall far short of the supply, and under these circumstances the Government of Jamaica might be glad to be placed in possession of information as regards a native rubber plant which stands so high in intrinsic value. Various samples of commercial rubber manufactured from the Jamaica plant are enclosed.

I am, &c.
(Signed) D. MORRIS.

Edward Wingfield, Esq.,
Colonial Office.

[*Enclosure.*]

INDIA-RUBBER, GUTTA-PERCHA, AND TELEGRAPH WORKS COMPANY to ROYAL GARDENS, KEW.

Silvertown, London, E., 17th October 1888.

The sample received with letter from Kew, dated 12th September 1888, consisted of a lactescent juice partially coagulated, with a strongly acid reaction. Fortunately it was contained in a stout glass bottle, about 10 ounces capacity.

The portion which had coagulated in the bottle could be removed only by fracturing the same. It was rinsed out so as to free it from adherent non-solidified milk, &c., and treated subsequently by itself. It will be referred to hereafter as A.

The non-coagulated portion was mixed with about twice its volume of water with about an ounce (fluid measure) ordinary acetic acid, British Pharmacopœia strength, &c. After a few days' exposure the coagulum rose to the surface in a fairly coherent form, and was collected and squeezed. This portion will be referred to hereafter as B.

The residual liquid was evaporated to complete dryness (and yielded less than half-ounce of solid, principally saline, matter, gum, &c.) so as to ascertain whether the juice itself contained any principle likely to produce a detrimental effect on the product, by any subsequent process of coagulation or inspissation. So far as we can see, the portion of the juice or sap which is rendered insoluble by evaporation would give the rubber a dark colour, and render it short. The finest Para rubber contains the entire juice or sap of the tree; the aqueous portion evaporates during the process of coagulating. It is doubtful whether the juice of the *Forsteronia floribunda* could with advantage be treated in this way. The juices of india-rubber producing plants are alkaline or neutral, never acid. By a process of fermentation which soon sets in the nitrogenous or other constituents of the juice produce sufficient acid to cause a separation of caoutchouc. Whether the *Forsteronia floribunda* juice if exposed in an open vessel would part with the whole of the caoutchouc in this way would be worth trying, with the recently collected juices.

It is quite possible that it would be an advantage to recover the caoutchouc as it was coagulated without using any artificial means; the mother-liquor should not be thrown away, but should be continually worked up with fresh juice.

The method recently given by Mr. Alvan Millson for the recovery of caoutchouc from the "Abba" tree, is admirably adapted for the treatment of the juice of the *Forsteronia floribunda*.

The rubber from this plant is so remarkably good that no time should be lost in submitting samples prepared on the spot. The rubber cannot be seriously deteriorated by any process likely to be used in its recovery.

There is no doubt but that the examination of the natural juice of a plant will, in most cases, enable one to point out what precautions should be taken to ensure the best result; still the fact must not be lost sight of that such an examination might lead one to suggest methods difficult of being carried out under surrounding circumstances.

The juice of the *Forsteronia floribunda* yields roundly one pound of dry and washed caoutchouc, or about 22 ounces of ordinary crude caoutchouc as generally met with, per quart.

A. About 2½ ounces of this product was recovered, the weight being that of the washed and dried article. In colour and strength it approaches more nearly to the better descriptions of Para rubber. Mixed with sulphur and treated it vulcanized perfectly, in being solid, firm, and strong. It is a light colour when vulcanized.

B. About 1½ ounce of this product was recovered when washed and dried. It was much darker in colour than sample marked A. This remark applies also to the washed product, but it is not nearly so tough as A.

LXXIV.—SEEDLINGS OF SUGAR CANE AT BARBADOS.

(*Saccharum officinarum*, L.)

The sugar cane is one of the most valuable economic plants we possess. It has been cultivated for so long a period that the primitive habitat of the species according to De Candolle, is unknown.* Bentham in *Flora of Hong Kong*, p. 420, states that "We have no authentic "record of any really wild station of the common sugar cane." Further than this, in common with many plants that have been for a long time under cultivation and reproduced solely by means of buds and suckers, the sugar cane so rarely produces muture fruits that no one, as far as we are aware, has ever seen them. Certainly in the rich Herbarium at Kew there are no seed-bearing specimens. In botanical works the subject is often referred to, but apparently only to restate the fact that botanists like McFadyen in the West Indies and Roxburgh in India "have never seen the seeds of the sugar cane."†

Schacht is one of the few persons who has given a good analysis of the flower of the sugar cane including the pistil; he also had not seen the ripe seed.

In discussing the problem how far the saccharine qualities of the sugar cane could be improved on the same lines as those so successfully adopted with regard to the beet it was lately pointed out in a letter addressed to the Colonial Office that, owing to the power of producing fertile seeds having apparently been lost by the sugar cane, it was impracticable to deal with it by means of cross fertilization or by the ordinary course of seminal selection. It was further pointed out that new and improved varieties amongst sugar canes were to be looked for amongst bud variations, and planters were advised to mark any canes that showed a departure from the type and cultivate them separately for experimental purposes, with a view to test their yield in sugar. Attention having thus been directed to the subject by official notices published in sugar-producing colonies, several communications have been received at Kew from persons who believed that they were able to afford some information on the point whether the sugar cane produces seed or not.

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* *Origin of Cultivated Plants* (1884), p. 755.

† *Hooker's Botanical Miscellany* (1830), Vol. I. p. 95, tab. 26.

First, as regards the actual seeds of the sugar cane. A correspondent at Fiji, in forwarding a small packet to Kew in April last, stated, "Some " time ago there was published in the Government Gazette of this " colony an extract from a letter from you in reference to sugar-cane " seed. I have been 18 years in sugar-producing countries, and have " never observed sugar-cane seed until within the last month, when one " of my sons brought me a head fully ripened from a garden in my " neighbourhood. Some time afterwards I went to see the sort of cane " from which the seed had been gathered, but the plant was dug up and " I could only learn that it was a purplish cane." The seed sent by this correspondent proved not to be the seed of a *Saccharum* at all; it was the seed of a *Sorghum*, and probably of *S. vulgare*, the common millet or Guinea corn.

Recently, however, a statement has reached Kew, from a trustworthy source, that seedling sugar canes had been found at Barbados, and that plants were in course of being raised at the Botanical Station in that island, under the care of Professor Harrison and Mr. Bovell.

Mr. J. B. Harrison is Island professor of chemistry and agricultural science at Barbados, and in conjunction with Mr. T. R. Bovell, who is superintendent of Dodd's Reformatory, he has been engaged for the last three years in cultural and chemical experiments with various kinds of sugar canes. The results of these experiments have been published officially by the Government of Barbados, and afford data of a valuable character as regards the effects of various manurial constituents applied to sugar canes, as also the relative merits of new and old varieties of canes now under cultivation in the West Indies.

The statement sent by Professor Harrison appears to prove, in a perfectly natural and circumstantial manner, that a few mature seeds may occasionally be produced by the sugar cane under certain circumstances. It is stated by Rumphius that the sugar cane "never " produces flowers or fruit unless it has remained several years in " a stony place." He does not, however, say whether he ever saw the fruit, nor does he cite any proof of the fact in the shape of seedlings, self-sown or otherwise. The canes that would be likely to produce fruit would be those varieties nearest to the original wild cane, and probably on that account they would be less rich in sugar than the canes improved by a long course of cultivation.

Without expressing a decided opinion on the subject, and in the absence of the specimens themselves, the information supplied by Professor Harrison is, so far, the most tangible of any yet received to show that the cultivated sugar cane may occasionally produce mature fruits.

Government Laboratory, Barbados, 17th September, 1888.

On certain of the higher districts of the island from time to time growths of sugar cane resembling fine grass have been noticed, but in most cases no attempts have been made to cultivate them. Mr. Parris some years ago succeeded in raising a few canes from the cane arrow or flowering shoot. Mr. Clarke did the same with the arrow of the purple transparent cane, but did not succeed in getting the seedlings to flourish, and my wife's father many years ago succeeded in getting the arrows to produce young canes, but not in cultivating them. Knowing these cases, Mr. Bovell and myself considered that a favourable opportunity of examining into this question offered itself during the cultivation of the varieties of canes which we have here. These canes were planted in rows of four broad by 25 feet deep, and so as to have two sets of each kind, in all 36 plots of 18 varieties, planted side by side. The plots were noticeable this year for the number of arrows sent up by some of the varieties. We gave strict orders to the labourers employed in weeding and watching the adjacent land to report to us any grasses springing up upon them in any way differing from the usual weeds. Towards the end of January they reported to us that a few tufts of grass different to the usual kinds were making their appearance. We found these to be growing in a rather narrow belt of the field on one side of the plots and in a little below it, following the direction of the prevailing wind. They were found not only on the surface of the field, but also on the bottom of a drain which had been dug in the field to a depth of 18 inches. Some 80 or 90 plants sprang up at intervals afterwards. We found a good deal of difficulty in keeping them alive, as the sun quickly shrivelled them up; it was necessary to protect them in many cases from the direct rays of the sun and to keep them constantly watered. In this way we succeeded in saving some 64 or 65 plants. Of these we carefully examined three or four so as to ascertain as far we could the absence of any particles of old cane in them. Their mode of growth was quite different to that of canes growing from the eyes of canes. Sixty plants were successfully transplanted, and are being cultivated. At present they are not far enough advanced in their growth to speak with certainty, but there appears to be amongst them several different kinds, probably five or six at the least. If you think it worth while, Mr. Bovell and myself will send you a specimen cane of each sort in January or February next, when they will be sufficiently far advanced to show their characteristics. The way in which they first grow is quite sufficient to account for them not being often noticed upon the fields. The weather here during January last was particularly favourable for their growth, and the fact of different varieties being grown side by side is, of course, much more favourable for the production of seed than the growth of one variety only. I have never heard of the Bourbon cane producing here fertile arrows, in all the alleged cases of fertility the arrows were either those of the purple or white-transparent varieties which, as you are aware, are prone to variation. We shall again attempt this year to obtain the same results. I am anxious to have the benefit of your opinion upon this year's results, as of course, if we can establish the fact of the cane occasionally, and, under certain favourable conditions, producing fertile seed, it will open an important field of investigation.

J. B. HARRISON.

LXXV.—RAMIE.

(*Boehmeria nivea*, Hk.)

The difficulties attending the development of the Ramie industry appear to be not confined alone to preparing the fibre as detailed in a recent note on the subject (p. 273).* It is also found that that those who have in a measure been successful in preparing the fibre in commercial quantities are disappointed with the reception this fibre has received at the hands of spinners and manufacturers. In a word, it is found that Ramie fibre when produced is practically unsaleable in the London market at the present time. A correspondent interested in Ramie estates wrote to Kew a short time ago:—

"We have spent much capital on Ramie, but as yet cannot see our " way to commercial success. We have produced excellent filasse, but " the cost has been far too great and the chief difficulty seems to rest, " not in the production of filasse, many systems [if the question of cost " is set aside] have accomplished this, but in the spinning of the filasse " into yarn. No British manufacturing firm appears willing to take up " this business except on terms that would practically give them the " monopoly; they also require a guaranteed minimum of raw material " which we cannot give."

In a subsequent letter the same correspondent states:—

"I am beginning to think that the only way to succeed with Ramie " is to follow M. Favier's system described in the *Kew Bulletin*, p. 148, " namely, to grow and treat it for a special purpose, and carry it right " on to manufacture. Then it will pay right well. At present the " filasse that would suit one manufacturer would be useless to nine " others, who would want it prepared differently."

Another correspondent, in a letter dated the 14th November, from a different point of view, appears to confirm the experience detailed above:—

" In the *Kew Bulletin* for June last there is an article upon Ramie " or Rhea fibre. Have you had any applications from, or can you put " me in communication with, any manufacturers, who may be disposed " to take up this fibre as a specialty? I am interested in a works and " process for the preparation of Ramie filasse in the form similar to the " enclosed sample. With our present appliances we could undertake to " deliver it at from ten to twenty cwts. weekly. So far we have not been " able to find any manufacturers here so inclined, and the prepared " material has been sent abroad. If you can render me any assistance " it will be esteemed a favour."

Since the receipt of these letters Kew has been favoured by Messrs. Ide and Christie, a respectable firm of fibre brokers in the City, with a copy of their monthly circular dated the 15th November. In this circular, under the head of China Grass and Ramie, it is stated:—

" On the 31st ulto. a large parcel, consisting of about 130 tons " ribbons and 20 tons ramie or rhea in various stages of preparation, " were put up for public sale, practically without reserve, and after " being widely announced. The prices realised, viz., 8*l*. to 9*l*. per ton " for the ribbons, and 20*l*. to 25*l*. for the ramie, were most disappointing " and testified to the languid interest which this material possesses for " the manufacturers of Europe. Considering the attention with which " planters in various parts of the world regard this material, and the

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* *Kew Bulletin*, November 1888, p. 273.

" numberless processes and machines which inventors have set forth " for its manipulation, the result of this sale must be viewed as distinctly discouraging. It would almost appear as if no true demand " exists for this interesting fibre, and that, in the present attitude of " the manufacturing interest, the application of skill either to cultivation of the plant or extraction of the 'filasse,' is premature and " misplaced."

In order to understand the present position of the Ramie industry it would be useful to adopt some kind of classification of the details connected with it. In the first place we have the mere business of cultivating the Ramie plant, and of producing stems with the fibre in the best possible condition. This is purely the work of the planter. Secondly, we have the the process or processes necessary to separate the fibre from the stems in the form of ribbons and filasse. It is necessary for many reasons that this should be done either by the planter on the spot, or by a central factory close at hand. Thirdly, we have the purely technical and manufacturing process in which Ramie filasse is taken up by the spinners and utilized in the same manner as cotton, flax, and silk are utilized for the purpose of being made into fabrics.

For our present purpose we may take it for granted that the cultivation of the Ramie plant presents no insuperable difficulty. Also that if a suitable selection of soil is made, and the locality possesses the necessary climatic conditions as regards heat and moisture, there is no reason to doubt that Ramie could be grown to greater or less extent in most of our tropical possessions. As regards the second stage—in which is involved the decortication of the Ramie stems—the problem, as shown at p. 273, is by no means completely solved.

On this really hangs the whole subject. The third stage is disappointing and unsatisfactory, because the second stage is still uncertain; and being thus uncertain the fibre is necessarily produced in small and irregular quantities, and only comes into the market by fits and starts. It would appear that Ramie fibre differs so essentially from cotton and flax that it can only be manipulated and worked into fabrics by means of machinery specially constructed to deal with it. Owing to the comparatively limited supply of Ramie fibre hitherto in the market no large firms of manufacturers have thought it worth while to alter the present, or put up new machinery to work up Ramie fibre. If appliances, or processes for decorticating Ramie in the colonies were already devised, and the fibre came into the market regularly, and in large quantities—say hundreds of tons at a time—there is no doubt manufacturers would be fully prepared to deal with it. At present the industry is practically blocked by the absence of any really successful means of separating the fibre from the stems, and preparing it cheaply and effectively. This, after all, is the identical problem which has baffled solution for the last fifty years.

LONDON: Printed by EYRE and SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.
[40.—375.—11/88.]

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